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Popular Mechanics Magazine

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Vol. 33 APRIL, 1920 No. 4

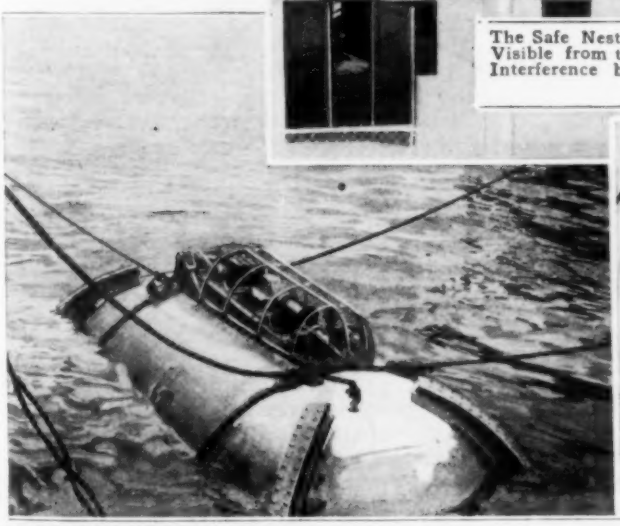
Floating Safe Sends Signals if Lost at Sea

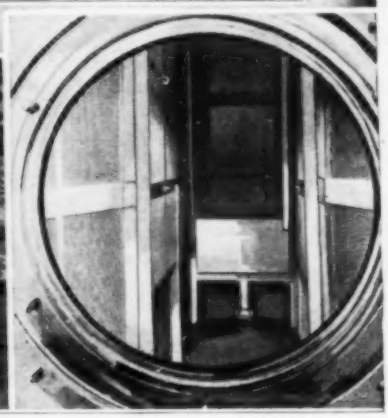
SENDING up a signal rocket every hour, flashing a light once in four minutes, and sounding a loud horn every nine minutes, is the remarkable automatic performance of a new floating ship's safe for registered mail, just adopted by the Netherlands postal service. All these things proceed to happen as soon as the safe, by any misfortune, is lost at sea. The rockets go up periodically only for the first 12 hours, but the horn, sounding for a minute at a time, continues to operate for three months.

The safe consists of a steel cylinder with hemispherical ends, buoyancy and security being obtained by nesting other cylinders within the outer casing. Normally it is carried in a cradle on the ship's deck, always visible from the bridge. The cradle automatically releases the safe if the ship sinks, and the signaling apparatus begins to work a half hour later, or after any interval for which it has been set.

Besides its ability to call for help, this curious seagoing vault is protected from unauthorized tampering, both on board ship and in the water. In its cradle, it is connected to the ship's dynamos, and a touch either starts a bell ringing or gives the meddler a severe shock. Afloat, its innermost door may be opened only with a secret combination, and in special cases a small compartment may be so arranged that if improperly opened its contents will

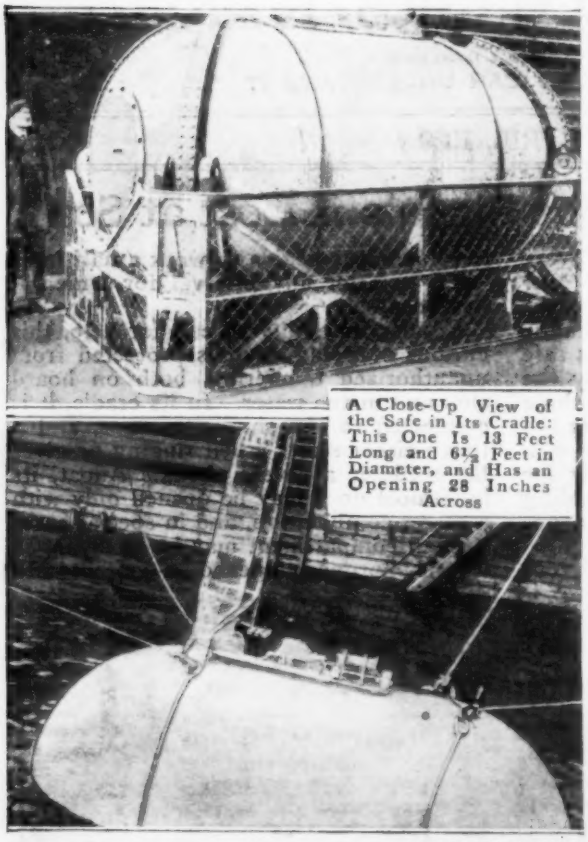
The Safe Nested in Its Cradle on Shipboard, Visible from the Bridge and Protected from Interference by Connection to the Ship's Dynamos





PHOTOS BY GILLIAMS SERVICE

At the Left the Safe is Seen Afloat, Just as It Appears When Its Carrying Ship is Sinking, and the Cradle Automatically Releases Its Hold. At the Right, the Safe's Interior Is Visible through Its One Round Door



A Close-Up View of the Safe in Its Cradle: This One Is 13 Feet Long and 6½ Feet in Diameter, and Has an Opening 28 Inches Across

PHOTOS BY GILLIAMS SERVICE

The Signaling Mechanism is Mounted on Top of the Safe, and Works Automatically When the Big Cylinder Is Afloat

be instantly destroyed and the rifler thus thwarted. Several sizes are made, a representative model already in use being 13 ft. long and 6½ ft. in diameter, with a single round opening of 28 in., having two or more covers. It carries a brass name plate for identification, and fixtures for hoisting it aboard ship. Because of its ingenious signaling equipment, the new safe, once afloat after shipwreck, is expected to prove a valuable adjunct to life-saving. Its various appeals by light and sound are certain to attract the attention of passing ships, and the lifeboat crews have only to remain in its vicinity to be assured of ultimate rescue.

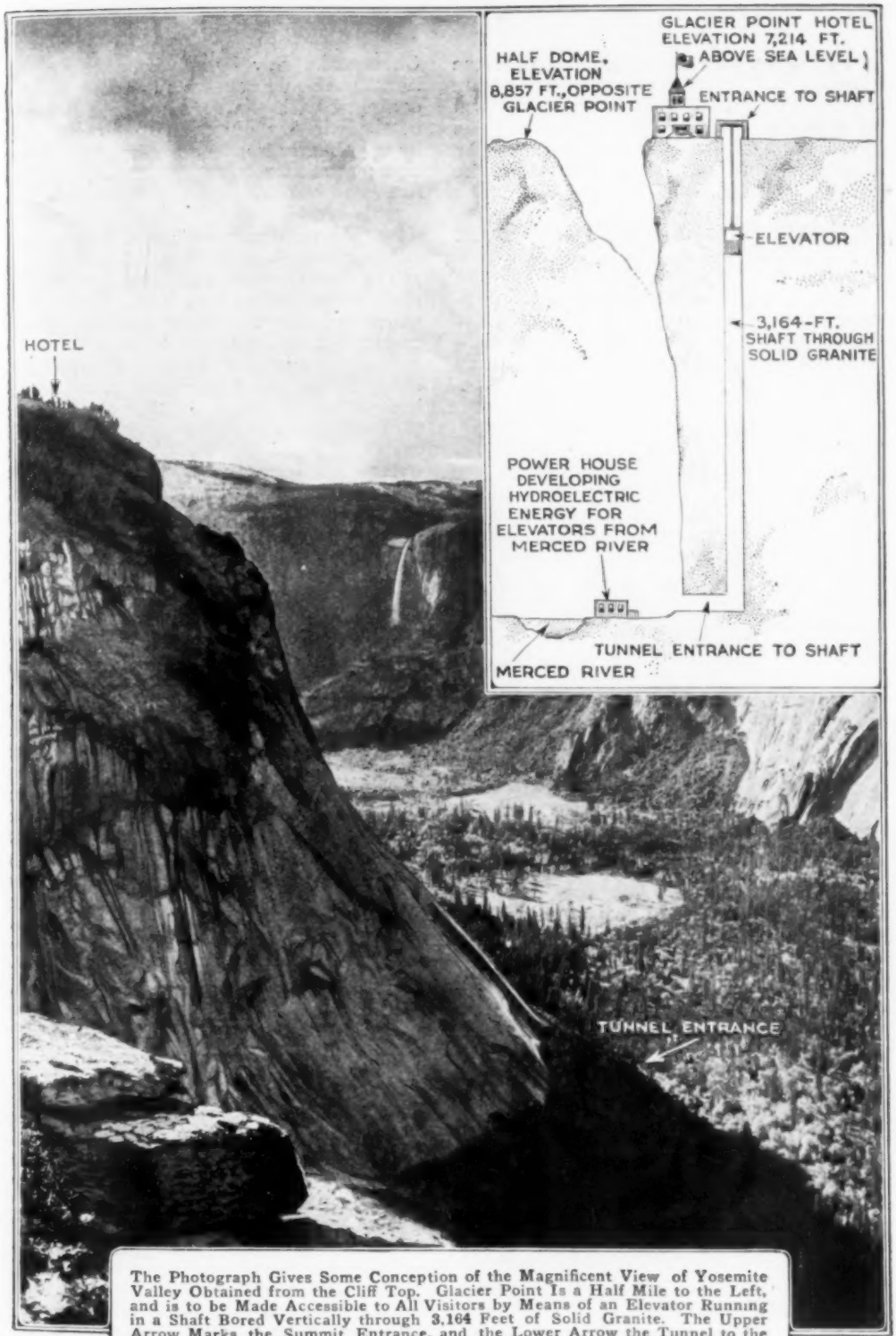
In its elemental capacity as a buoyant container discharged from a ship, the device bears an interesting relation to the one described in this magazine in January, 1917. The earlier model, however, performed no spectacular signaling feats, but merely floated until it was picked up or washed ashore. Shipment of valuable mail in the new safe-keeping float has been marked by the issue of a new series of special stamps. The safe is now used only between the Netherlands and the East Indies.

YOSEMITE PARK ELEVATOR WILL HOIST VISITORS TO GLACIER HOTEL

VISITORS to the Yosemite National Park in the near future will not be compelled to remain on the floor of Yosemite Valley because of the dangerous roundabout trip to the summits of the cliffs above. Instead they will enter an elevator, to be quickly hoisted through 3,164 ft. of solid granite, and step out on Glacier Point at an elevation of 7,214 ft. above sea level, according to an announcement recently made by the Federal director of the national park service at Washington.

In spite of the fact that Glacier Point is one of the most majestic high places in all the world, very few of the countless thousands of visitors to the national park have ever stood thereon. This is for the reason that the trip to it necessitates a climb up the face of the cliff over a stairway cut in the rock, or a motor trip of 65 miles over a dangerous mountain road with grades up to 34 per cent that practically wear out a complete set of tires. Because of the high elevation of this road it is blocked with snow during a large part of the year, making it possible to operate the Glacier Point hotel only during the summer months. The elevator service through the cliff will enable travelers to reach Glacier Point quickly and easily, and at any time of the year.

According to the director, this elevator was planned several years ago, but the actual construction was regarded as an almost impossible feat of engineering. The government, however, refused to abandon the idea, and recently closed a contract with a mining engineer for the construction of the shaft. Work is to be-



The Photograph Gives Some Conception of the Magnificent View of Yosemite Valley Obtained from the Cliff Top. Glacier Point Is a Half Mile to the Left, and is to be Made Accessible to All Visitors by Means of an Elevator Running in a Shaft Bored Vertically through 3,164 Feet of Solid Granite. The Upper Arrow Marks the Summit Entrance, and the Lower Arrow the Tunnel to the Bottom of the Shaft. The Diagram in the Corner Indicates the Work Involved, and Shows How the Elevator will be Operated by Power from the Merced River

gin at once, and it is expected that the elevator will be in actual operation within a year. The plan also calls for the erection of a power house near the foot of the shaft, where hydroelectric power will be developed from the Merced River for the operation of the lifts.

RADIO "BEACONS" MAY REPLACE LAMPS OF LIGHTHOUSES

Gradual improvement of the radio compass, since it was described in this maga-

Smith's Point Lighthouse, on Chesapeake Bay, One of the Stations Experimentally Equipped for Sending Guiding Signals to Ships by Wireless

zine in January, 1912, has now brought it to the point where it threatens to displace the familiar guiding beacon of the lighthouse lamp. Recent experiments in Chesapeake Bay by government authorities have demonstrated that a ship equipped with the rotating receiving coil of the wireless direction finder can take its own bearings, and determine its proper course, practically with as great accuracy as when guided by visible rays. The signals are sent out from three shore stations, the transmitting apparatus working automatically every 30 seconds.

On Shipboard: The Operator in the Center is Attending the Rectangular Pivoted Coil of the Radio Compass, the Nearer Object Being the Usual Magnetic Compass

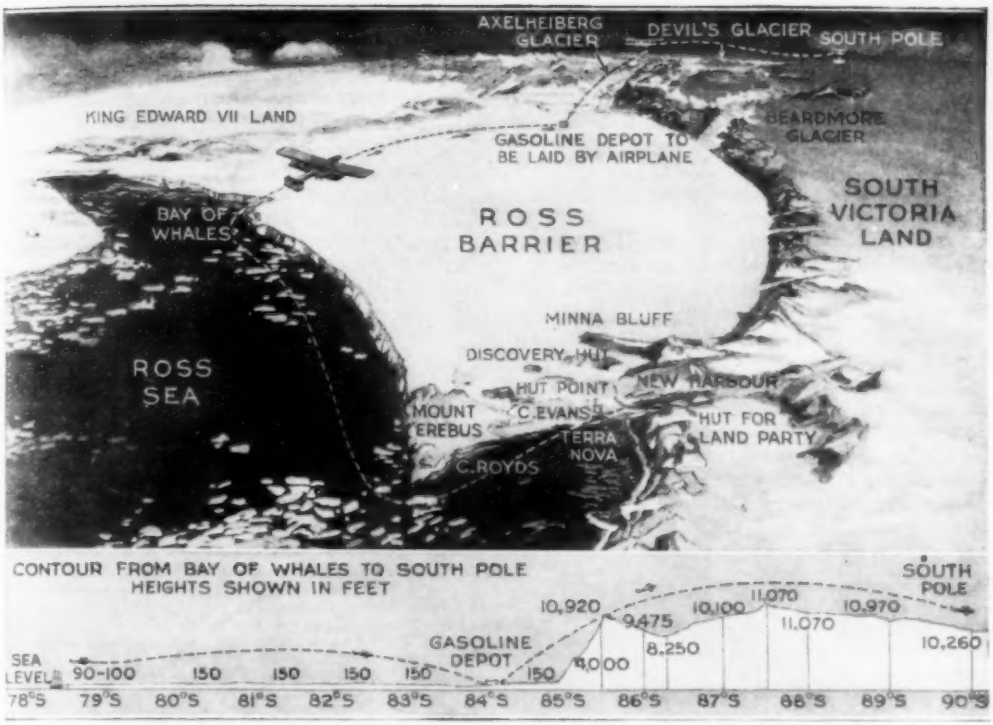
The equipment used is very simple, the ship's receiving aerial consisting merely of a coil on a rectangular frame, which rotates on a vertical axle and carries a pointer for laying off on a chart the direction of the lighthouse from which the signal is received. A special four-stage amplifier was used, and after making corrections for interference by other objects on deck, the error was less than ½ mile in 50. The experiments were so satisfactory that practical adoption of the system is regarded as a foregone conclusion.

FOG AND CLOUDS MAY HINDER AERIAL MAP MAKERS

London's murky atmosphere is the chief obstacle foreseen by airmen who propose to make a photographic map of the world's largest city in the near future. The scheme involves the use of numerous airplanes, equipped with automatic cameras. A series of pictures, taken while the machines fly over the metropolis, will be fitted together to form the map. In most localities, this idea could be put into effect without trouble on clear days, but in London there is seldom a time when the air is entirely free from fog and clouds. For this reason, it is expected that a large number of flights will be required to obtain a complete collection of photographs.

MAURITIUS IN INDIAN OCEAN TO ELECTRIFY RAILWAYS

Showing on most maps as an inconspicuous dot in the Indian Ocean, just east of Madagascar, the island of Mauritius nevertheless has 11 electrically lighted towns, some 120 miles of railway of standard gauge, and a plentiful supply of water power. The island's prosperity has made practical the project of electrifying its railroad system, and the power of the Tamarin River alone is sufficient, it is estimated, to operate the lines and supply all the current needed for other purposes. Materialization of the plan now awaits only a supply of the necessary equipment.



FROM THE SPHERE, LONDON, COPYRIGHT BY THE NEW YORK HERALD

The Largest Hut will be Erected at New Harbour, and Here the Land Party will Pass Five Sunless Winters. The Airplane will be Carried by the "Terra Nova" to the Bay of Whales, Whence It will Fly to the Pole. The Sectional Diagram, below the Picture, Gives an Excellent Idea of the Climb Necessary if the Plane is to Gain the Level of the Vast Polar Plateau. Heights above Sea Level Are in Feet

SOUTHWARD, HO!

Airplane, Ship, and Sledges to Carry Explorers on Completest Survey of the Polar Continent

By PAUL A. JENKINS

TO Antarctica, roof of the world, for six years' work, is shortly to sail the most completely outfitted polar expedition ever assembled. Alas for romance, however, its aim is not glory, but a complete commercial survey of the white continent and the encircling seas. The British Imperial Antarctic Expedition, as it is called, is backed by great governmental, scientific, and financial interests, which have raised $750,000 to insure its complete success. They believe that it will extend appreciably the commercial boundaries of Great Britain. Meeting, a few weeks ago, in London's historic Mansion House, representatives of the governments of Australia and New Zealand, the British Air Ministry, the Royal Society of Great Britain, and other eminent scientific bodies, agreed that the empire stands to profit enormously from the capital invested in this expedition.

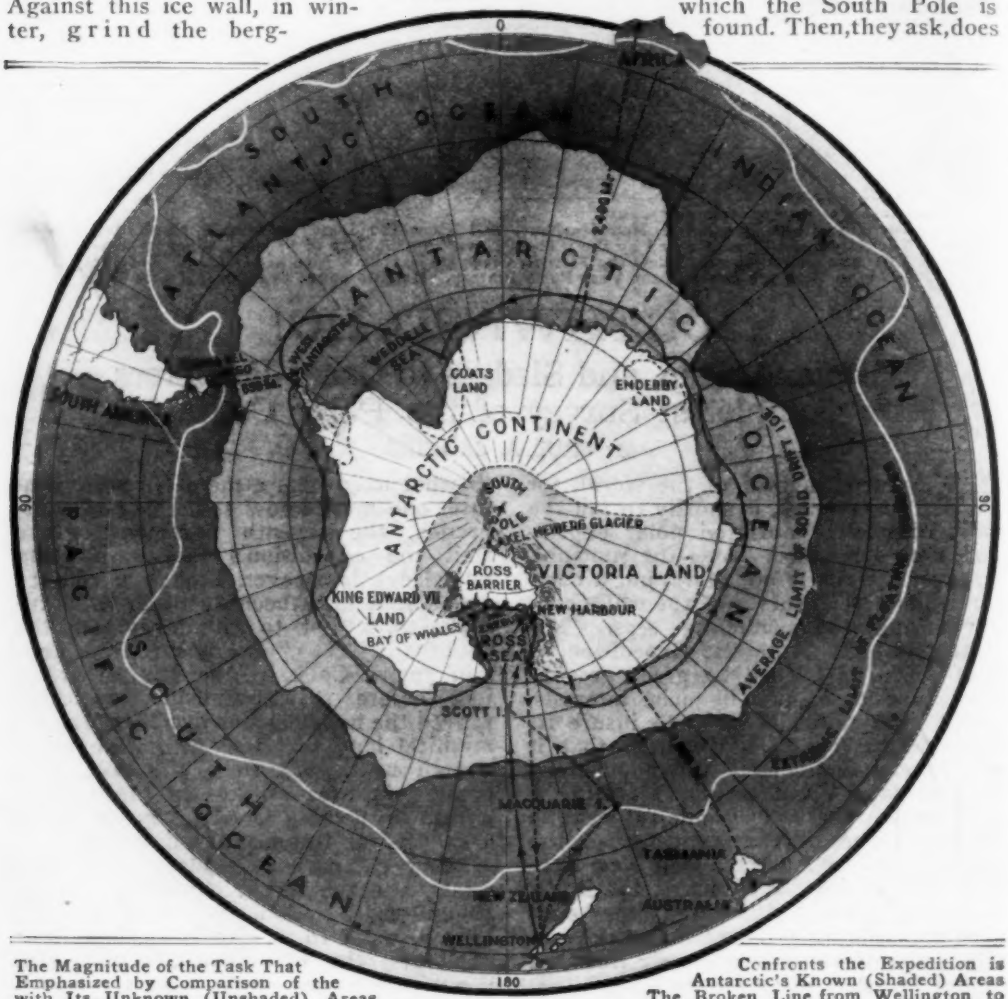
To know why these sober statesmen and scientists are lending every support to what may seem a mere Quixotic venture, one must know something of Antarctica, the seventh continent, where wait the expedition's tasks. Existing knowledge is meager, though a century and a half have been spent in its accumulation. First to circumnavigate the "Southern Ocean," at any rate, was Captain James Cook, whose famous cruise just before the American Revolution proved the nonexistence of the enormous, mythical land that long was thought to stretch northward from the pole, surpassing in area all known lands combined. Following Cook's voyages came a century of fragmentary discoveries by whaling captains and adventuring mariners, and the recent exploits of Scott, Amundsen, Mawson, and Shackleton.

As revealed to us, chiefly by these later explorers, the continent of Antarctica lies within a vast circle, with the South Pole as its center and a radius of about 1,400 miles. From the shore of this frigid

continent to Africa is about 2,400 miles; to Australia about 1,950; while the island of Tierra del Fuego, below the tip of South America, is but 650 miles from the peninsula called West Antarctica. Cutting deep into opposite sides of Antarctica, like the impressions of a pinchers, lie Weddell Sea and, notably, Ross Sea, of which much will be read later. Blanketing Antarctica, except where pierced by rugged mountain ranges, lie endless glaciers, built up by unmelting snowfall through immemorial centuries.

As if to repel the invading explorer, these sullen glaciers crawl in every direction from the vast central plateau, easily the highest in the world, to the seas, where they form a precipitous barrier, sometimes 10, oftener 150 ft. in height. Against this ice wall, in winter, grind the berg-studded ice packs; in summer the relenting barrier drops an innumerable litter of bergs or "calves," to use the whalers' racy idiom, into the encircling seas. In Ross Sea, strangely enough, the barrier floats like a raft, its seaward edge 400 miles long, and as many miles from shore. In general, it is this omnipresent barrier that has made coastal exploration so difficult and inconclusive that today the map makers can indicate with certainty only 15 per cent of Antarctica's coast line.

This brief description of Antarctica makes more intelligible the very practical problems which face this most elaborate polar expedition. First of all, cartographers want the coast line charted, and limits found for the great plateau on which the South Pole is found. Then, they ask, does



The Magnitude of the Task That Confronts the Expedition is Emphasized by Comparison of the Antarctic's Known (Shaded) Areas with Its Unknown (Unshaded) Areas. The Broken Line from Wellington to New Harbour and Return Indicates the Terra Nova's First Cruise. The Continuous Line Shows the Route of the Second Four Years' Voyage for the Purpose of Establishing the Coastal Boundaries

the mountain chain along the west coast of Ross Sea stretch unbroken across the continent, forming a continuation, except for 650 miles, of the South American Andes? Here, obviously, is work for the expedition's airplane, of which, again, more later. With the nation's pocketbook in mind, Britain wants to know the extent of the coal, manganese, granite, marble, and ruby deposits already located. Where, again, are the breeding places, the secret rendezvous of the whales, 12,000 of whom in a recent year yielded $10,000,000 worth of oil, glycerin, soap, margarine, fertilizer, and other by-products? Australia, New Zealand, and South Africa want Antarctica's climate charted, that the meteorologists at home may trace the cyclones of the southern hemisphere from their inception. Scientists throughout the world, finally, are demanding information of electrical conditions near the pole, that they may found on established fact their intricate studies in terrestrial magnetism. Some imagine the pole as holding a clue to the origin of the mysterious "messages from Mars" that have lately been the subject of world-wide controversy.

FROM THE SPHERE, LONDON. COPYRIGHT BY THE NEW YORK HERALD

The Leader of the Expedition Is Mr. John L. Cope, Who Served as Biologist and Surgeon on the Ill-Fated Venture of 1914-17

The leader of the expedition that is to make this most comprehensive survey of Antarctica, is Mr. John L. Cope, a veteran of many campaigns beneath the Southern Cross. He was a member of Shackleton's ill-fated expedition of 1914-17, serving as surgeon and biologist to the Ross Sea party, which laid food depots along the Ross Barrier in preparation for the expected transcontinental dash from Weddell Sea. For chief of his scientific staff, Mr. Cope has selected Capt. G. H. Wilkins, second in command of the Steffansson arctic expedition of 1913-17, and lately prominent as a contestant in the England-Australia airplane contest. It is Captain Wilkins who will pilot the expedition's plane on the mapping flights and the flight to the pole. Sledging operations of the largest shore party will be under the direction of Mr. Ernest Joyce, whose name has, likewise, long been linked with polar enterprise.

The ship chosen to bear the party to Antarctica is the "Terra Nova," a seasoned whaler whose wooden sides have withstood the battering of many voyages within the polar circle. The vessel was first heard of when it went to Captain Scott's rescue in 1904. Admiring then its strength and general layout, the captain later chose it to bear him southward in 1910 on the trip that won the pole but cost his life. But the "Terra Nova" of 1920 is to be even better adapted to her work than the ship of 1910. The coal-burning boiler and the compound engines that formerly turned the single propeller, in the absence of a sailing wind, are now replaced by an oil engine of 320 hp. Smaller oil engines will drive winches, bilge pumps, and lighting and wireless generators. The fuel, 275 tons of it, will be a nonfreezing kerosene, and will be carried in large tanks along the keelson. As the engines will often operate in temperatures down to —45° F., it has been decided to use the nonfreezing fuel in the cylinder jackets also. The liquid fuel will, of course, be used for cooking and heating. But the greatest gain from this substitution of oil for coal, will be the increase in cruising radius by some four and a half times.

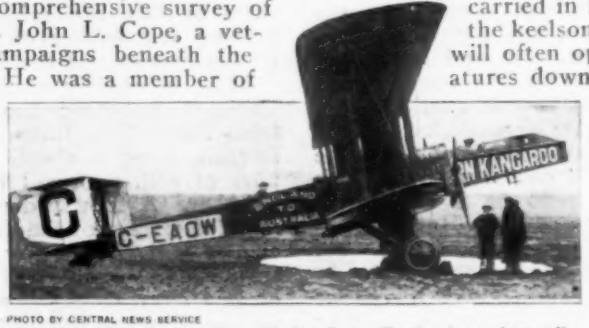
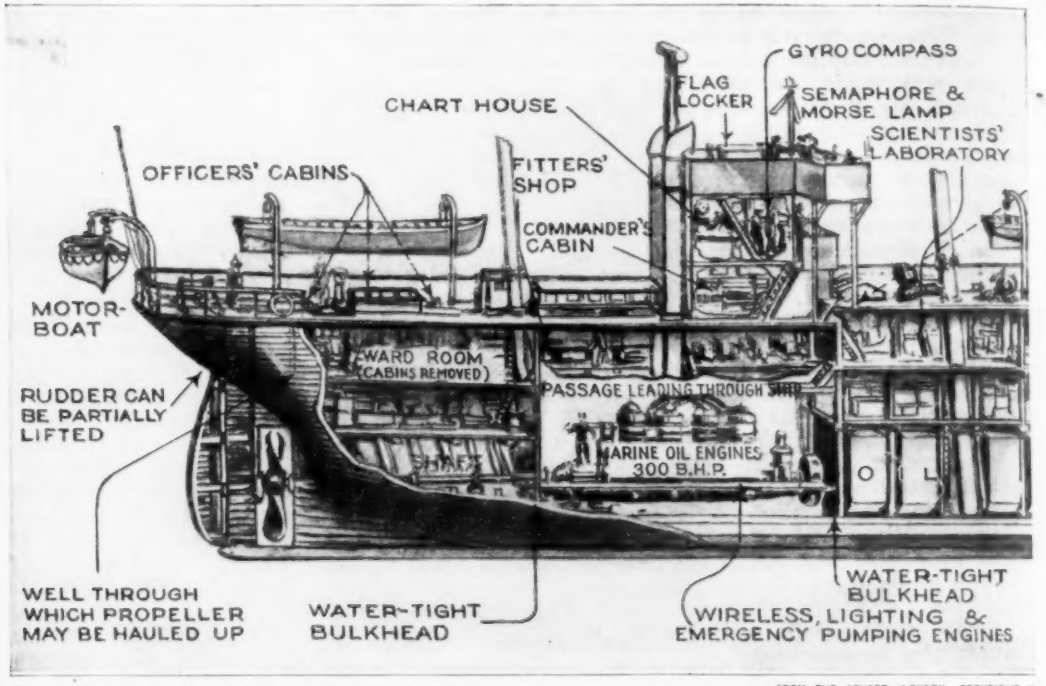


PHOTO BY CENTRAL NEWS SERVICE

The Plane Pictured is Now Flying from England to Australia, but Is Essentially Similar to the Polar Machine

The fitters are now busy, also, with the installation of two telescoping wireless



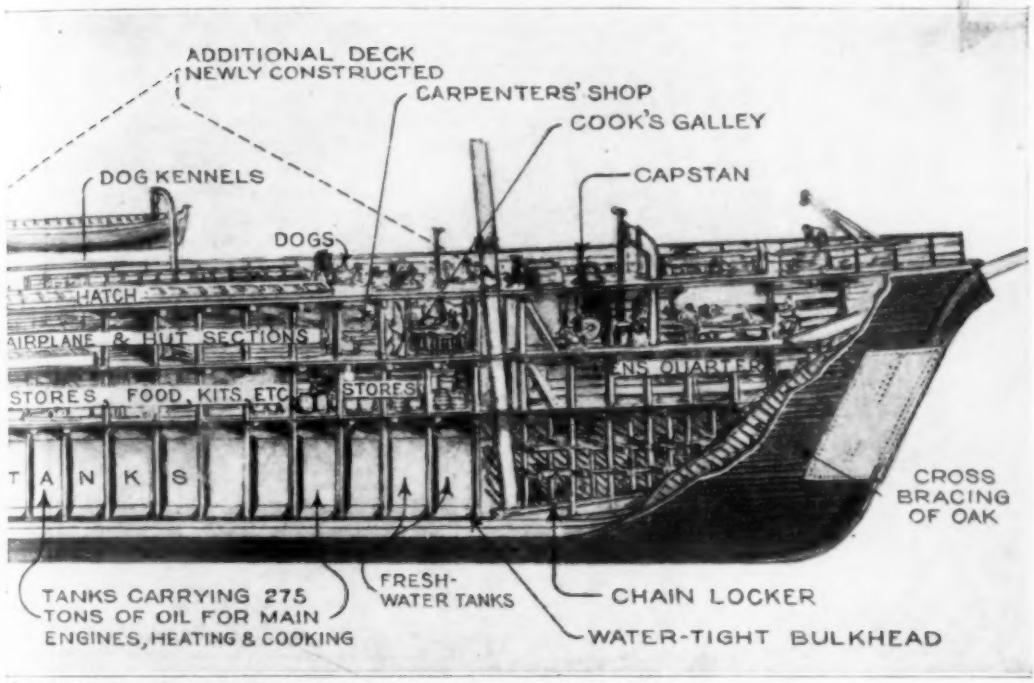
FROM THE SPHERE, LONDON. COPYRIGHT IN

Shown in Sectional View, Above, Is the "Terra Nova," Chosen to Bear the Expedition through the Dangerous Deck, Amidships. Four Water-Tight Bulkheads are being Built, Also, as It Is Certain That the Wrenching of the

masts, which, when extended, will enable the expedition to keep in constant touch with the stations of Australia and the southern islands. Incidentally it will be possible to set these up at a shore station. A smaller, but equally important addition to the "Terra Nova's" equipment, is the gyroscopic compass, which will be valuable because unaffected by the abnormal magnetic conditions near the pole. Finally, the carpenters are busy with the construction of a top deck over the present well deck, making the "Terra Nova" a flush-deck craft, and hence better fitted to shake off the mountainous seas that will often break over her.

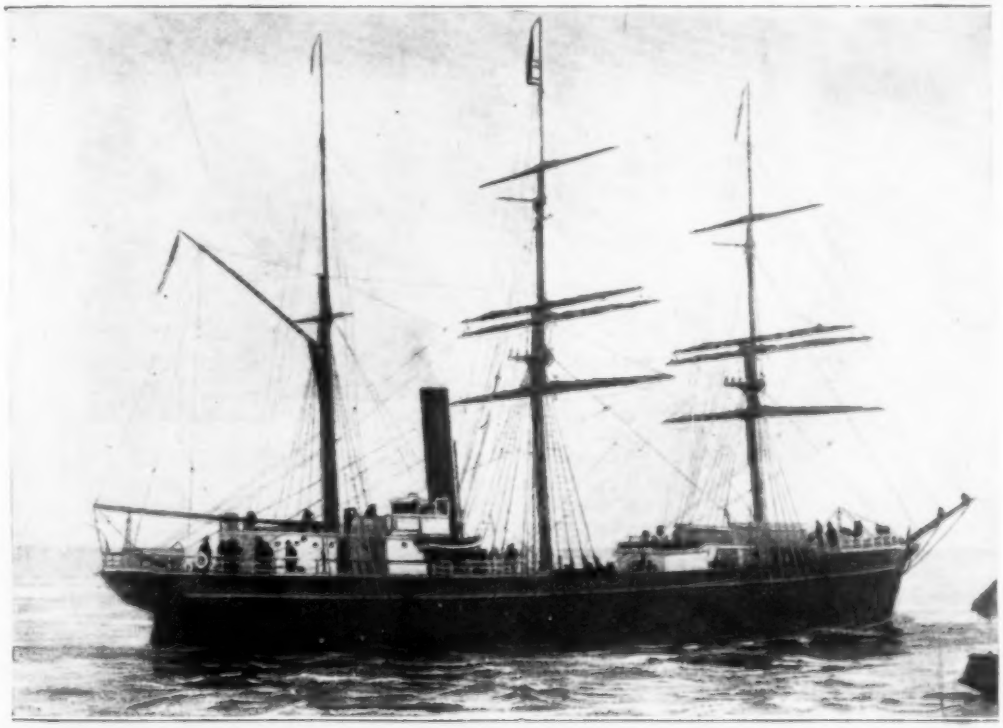
Beneath this new top deck will be stored the mortised sections of the three small huts and the one large hut. This larger structure is to be a real home for the shore party at New Harbour, affording comforting contrast to the cramped hovel, measuring only 15 by 15 ft., in which Borschgrevink's party of ten in 1899-1900 passed the first winter ever spent by man on the seventh continent. Beneath this top deck, too, will be carried the parts and spares of the airplane. This plane is to be one of the familiar "Kangaroos," which have carried thousands of passengers and parcels between English cities in the last year, without an accident to persons or planes. Each is propelled by two Rolls-Royce engines, measures 75 ft. in span, and makes a top speed of about 100 miles an hour. The expedition's plane has already been purchased by Mr. Cope, and is now being remodeled to take a crew of four, in addition to provisions for a month, fuel for 1,500 miles, and a sledge to which is strapped a tent, shovels, stoves, and other camping and photographic gear. Broad skids or skis are being built to permit landing and taking off from the snows of the barrier and the inland plateau.

Thus, splendidly equipped, the British Imperial Antarctic Expedition will sail from England in June of this year. Wellington, New Zealand, will be the last port of call, and will be left behind in October. A thousand miles through the mingled waters of the Indian and Pacific oceans will then bring the adventurers to the limit of the floating ice, and a day or two later, to Macquarie Island which will be surveyed in short order. Another southward journey of the same length, through constantly thickening ice floes, will bring them to Scott Island, where three scientists, with their hut, will be marooned for a year's investigation. The ship will now be in the midst of the pack, ceaselessly dodging icebergs, and

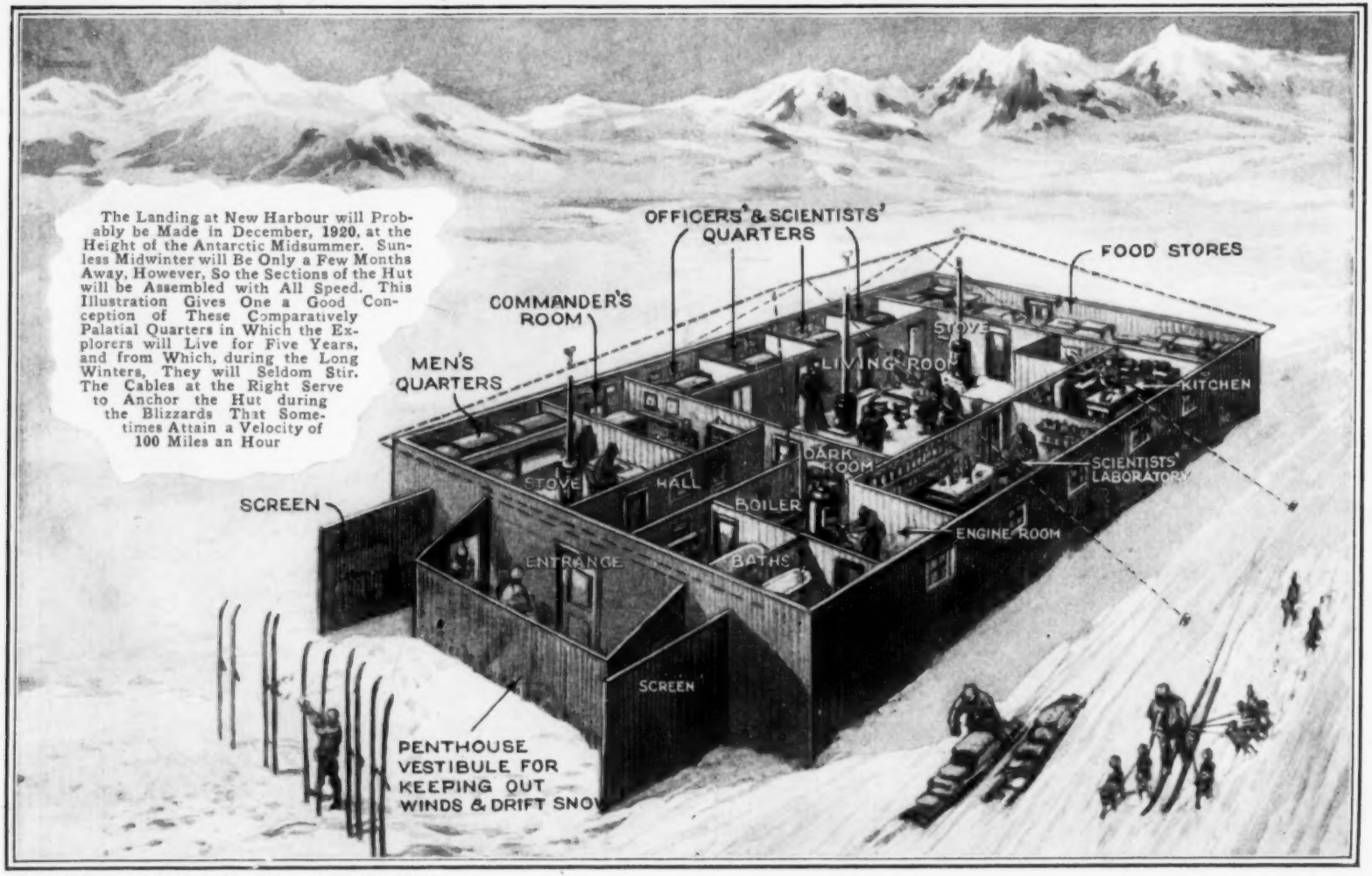


THE U. S. A. BY THE NEW YORK HERALD SERVICE

Antarctic Ice. It is being Converted into a Flush-Deck Vessel by the Addition of a New Deck over the Former Well Ice will Occasionally Open a Seam or Two. An Oil Engine will be Substituted for the Old Coal-Burning Boiler



The "Terra Nova" Is a Small Ship, but a Larger would Often Find It Impossible to Pick Its Way through the Pack, Which Oddly Resembles an Unsolved Jig-Saw Puzzle


The Landing at New Harbour will Probably be Made in December, 1920, at the Height of the Antarctic Midsummer. Sunless Midwinter will Be Only a Few Months Away, However, So the Sections of the Hut will be Assembled with All Speed. This Illustration Gives One a Good Conception of These Comparatively Palatial Quarters in Which the Explorers will Live for Five Years, and from Which, during the Long Winters, They will Seldom Stir. The Cables at the Right Serve to Anchor the Hut during the Blizzards That Sometimes Attain a Velocity of 100 Miles an Hour
OFFICERS' & SCIENTISTS' QUARTERS
FOOD STORES
COMMANDER'S ROOM
MEN'S QUARTERS
STOVE
LIVING ROOM
KITCHEN
DARK ROOM
SCIENTISTS' LABORATORY
STOVE
HALL
BOILER
SCREEN
ENGINE ROOM
ENTRANCE
BATHS
SCREEN
PENTHOUSE VESTIBULE FOR KEEPING OUT WINDS & DRIFT SNOW

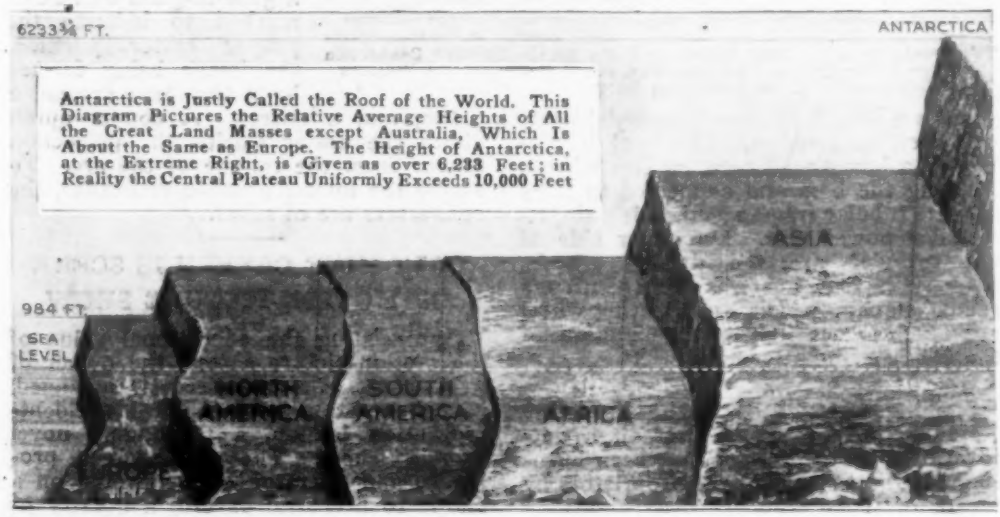
FROM THE SPHERE, LONDON. COPYRIGHT IN THE U. S. A. BY THE NEW YORK HERALD CO.

often ramming the scattered floes which in a few months will cement themselves into a continuous mass. Antarctica's "summer" months, it must be remembered, are November, December, January, and February. During this time the unsetting sun brings the mercury very nearly to 30° F. This the explorers call "hot weather."

In the comparatively open waters of Ross Sea good speed will be made to New Harbour at the northern limit of Ross Barrier. On this historic ground, just a few miles from the huts built by Captain Scott in 1902, by Lieutenant Shackleton in 1908, and by Captain Scott, again, in 1911, the expedition will land its largest shore party, with supplies for a year's stay. These men will assemble the large hut, and establish themselves comfortably, anticipating the sunless winter soon to come, while the ship crosses McMurdo Sound, to Ross Island. Here, in the shelter of Mount Erebus, an active volcano towering 13,300 ft. above the sea, six men will be landed with supplies for a year. Three of these will study weather conditions and the breeding habits of the penguin, while three make their way to a central point on Ross Barrier, where they will attempt to spend the winter.

Meanwhile, the "Terra Nova" will have sailed along the barrier's 400-mile front to the Bay of Whales, where the airplane will be put together, and a start made, about Christmas Day, 1920, for the pole, 800 miles to the south. A nonstop flight unfortunately will be impossible, as the level expanse of the barrier is terminated, 400 miles to the south, by the mountainous escarpments of the central plateau. So, at the foot of Axel Heiberg Glacier, discovered and named by Amundsen during his rush to the pole in 1911, will be established a depot of food and gasoline. Lightened in every possible way, the big plane will then rise from the barrier surface, make its spiral climb for altitude, and finally dart southward at 11,000 ft. If the plane comes to grief on the polar plateau, the crew of three, under Captain Wilkins, will attempt to draw their sledge back to the depot. On their return to the Bay of Whales the "Terra Nova" will pick them up, then cruise north at full speed, for the days will be growing short and the pack will be showing a desire to catch and hold the ship for the winter.

Left at last to their own resources, the shore parties about the Ross Sea will busy themselves with the killing of seals for food and fuel, with the furnishing of their huts, with the installation of the scientific apparatus, and, in general, with the establishment of the winter routine. During the months of May to August the sun will not be seen, and the thermometer will hover regularly around —20°, —40°, and —60° F. But the scientists will have much to do. Air temperature, pressure, and relative humidity, wind velocity and direction, and all electrical phenomena will be observed every other hour. Through cracks in the floe, the thickness of the sea ice will be measured daily, after a net has been lowered for a catch of the plant and animal life with which antarctic waters abound. Within each hut, all members of the party will take their turns at cooking, scrubbing, and standing guard.



Antarctica is Justly Called the Roof of the World. This Diagram Pictures the Relative Average Heights of All the Great Land Masses except Australia, Which Is About the Same as Europe. The Height of Antarctica, at the Extreme Right, is Given as over 6,233 Feet; in Reality the Central Plateau Uniformly Exceeds 10,000 Feet

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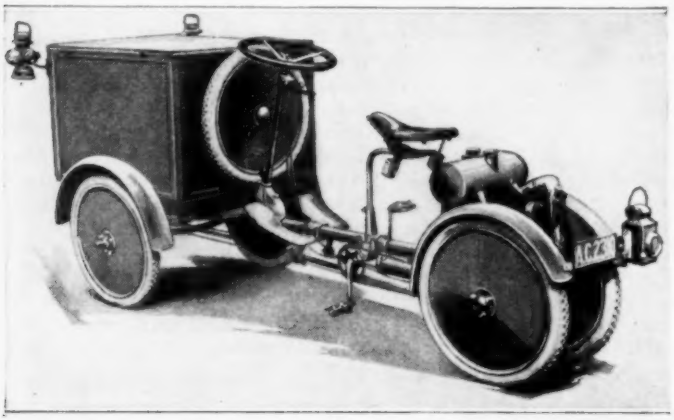
So the dark months will pass, until the returning sun permits sledging operations to start, in the middle of October. Then the geologists and biologists will fill their cases with specimens from the shore and the interior. About New Year's Day, this being the height of summer, the "Terra Nova" will reappear; the scattered parties will be returned to the central hut at New Harbour, and provisions for four years will be carried ashore. The "Terra Nova" will then sail away again, this time on a four-year's cruise around Antarctica, for the purpose of fixing the coast line, observing whale life, and collecting all possible information. The airplane will be much used during these years for long flights into the mainland, the aerial camera being carried on such occasions for quick and accurate map making. The plane is expected to prove valuable, too, for the transportation of supplies to parties sent inland from the ship. The "Terra Nova" will, of course, be locked in the pack ice every winter, but probably far enough from shore to escape the annihilation which overtook Shackleton's "Endurance" in 1915. In the early summer of 1925, if everything goes well, the "Terra Nova" will reach New Harbour once more, take aboard the long-exiled scientists with their precious reports and specimen cases, and sail north for Wellington, which should be reached in February, the following year.

HYBRID MOTOR VEHICLE BUILT FOR DELIVERY OF PACKAGES

One of the most unusual automotive commercial vehicles to appear in recent years is a British light-weight model lately exhibited at London. The load is carried in a box placed between two wheels. Pushing the box, and connected to it by a single tubular frame member, is a single-cylinder power unit. On either side of the cylinder are the driving wheels, scarcely a foot apart. The chauffeur's saddle, starting pedals, and steering wheel are fixed to the intermediate section of the tubular frame member.



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The Proximity of the Rear Wheels, and the Single Tubular Connection between Power Unit and Package Box, Are Two Noteworthy Features of This Peculiar Commercial Car, Recently Exhibited in London

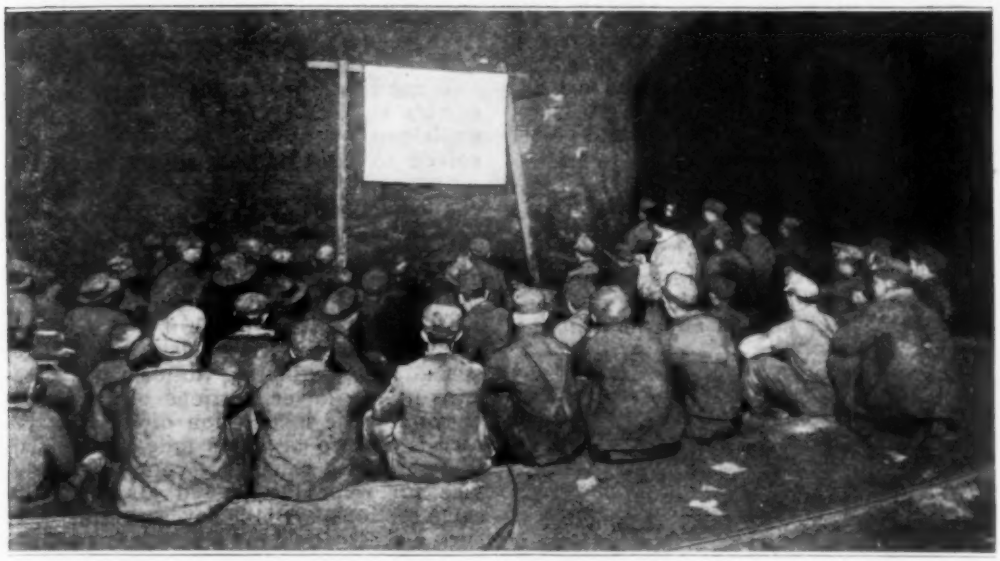
Striking farm hands in the Argentine Republic have to their discredit a new form of sabotage. They have been burning the wheat stacks of the proprietors by means of sun glasses placed at night.

IMPROVED SEARCHLIGHT GIVES INTENSITY WITH SMALL ARC

Recent refinements in the arc system of the 60-in. searchlight used by the U. S. Army make it possible to obtain a compact beam of high intensity with electrodes only 7/16 and 5/8 in. in diameter. The amperage used is 150 to 160, at 80 volts. The special composition electrodes are coated to reduce oxidation, and the larger positive is rotated to maintain an unbroken crater. The arc is inserted in the searchlight through a rear window, and the operator observes it by means of a ground-glass screen, marked to indicate the proper crater position, the image being formed by a tiny lens system, a prism, and a mirror. A copper apron above the crater shields the projection mirror from the tongue of the arc. To assure the lowest possible resistance, the connectors are of silver.

SALT-MINE CAVERN IS SCENE OF MOTION-PICTURE SHOW

Appreciating the educational value of the motion-picture screen, the owner of a Michigan salt mine recently arranged, in collaboration with a local accident-prevention bureau, a thoroughly novel "movie" show. The reels, screen projector, and operator, were lowered on a "skip" to a central cavern, a quarter of

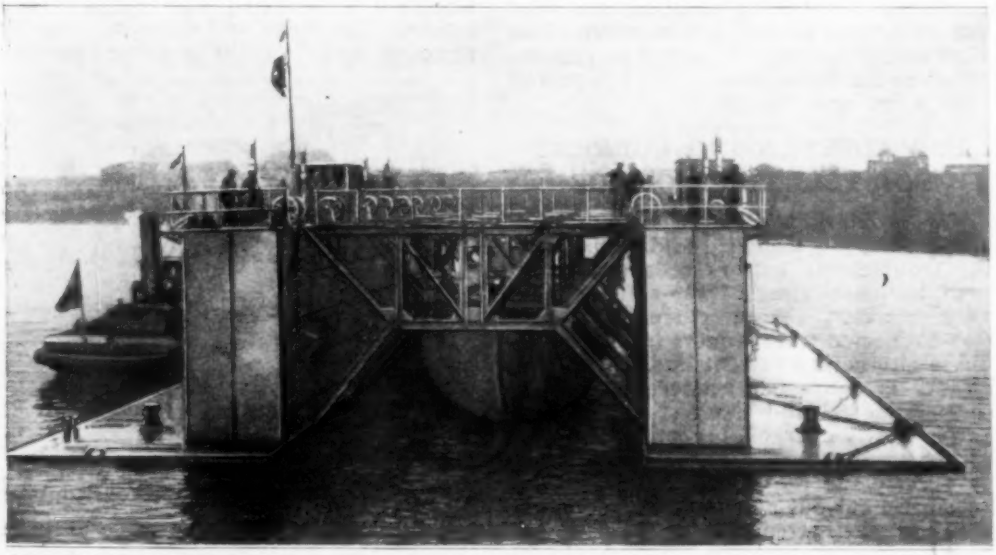


Instruction in Accident Prevention Was the Purpose of This Motion-Picture Performance, Held in the Heart of a Michigan Salt Mine

a mile below the surface. Here, while the miners gathered from the distant workings, the operator raised his screen on a crude frame, and connected his projector to the mine's electric circuit. When the entire force had assembled, the projector unreeled the warning gospel of "Safety First." No music accompanied the performance; instead was heard the whirring of the projecting machine, curiously magnified to a roar by the encircling walls of salt.

BIG FLOATING SALVAGE DOCK LAUNCHED AT GERMAN YARD

Having mined and torpedoed a large percentage of the world's ships, it now seems that Germany is preparing to salvage as many as possible, at the usual rates. As evidence we have the photograph of a floating dock that recently left the ways at Kiel. The structure consists, in general, of two groups of box-like pontoons, whose tops are held in



Germany's Newest Floating Salvage Dock: Hanging from the Pulleys along the Inner Edges of the Upright Pontoons are Seen the Heavy Cables Which are Passed beneath the Sunken Vessel

rigid connection by lattice girders. To salvage a sunken ship, the dock is towed to the spot, and the pontoons filled and lowered on either side of the vessel. Chains are then passed beneath the ship, the pontoons are emptied, and the vessel brought to the surface.

MOTOR "SCOOTERS" IMPROVED AS CAR'S POPULARITY GROWS

England's growing interest in the motor "scooter" has resulted in the development of several models affording all the

Accessibility of Controls and All Engine Accessories, and Physical Comfort for the Rider have been Provided in the Design of This Newest "Scooter"

conveniences of the light-weight motorcycle. One of the latest scooters is notable for a number of features, among them a horizontal engine, with the magneto in line with the single cylinder, direct chain drive to the rear wheel, a strong tubular frame, and a motorcycle saddle. Having this saddle to sit upon, the rider can cover long distances in comfort. The rider stood continuously, it will be remembered, on the first scooters, which appeared only a few months ago.

USE ALTERNATING CURRENT FOR TELEGRAPH OFFICE

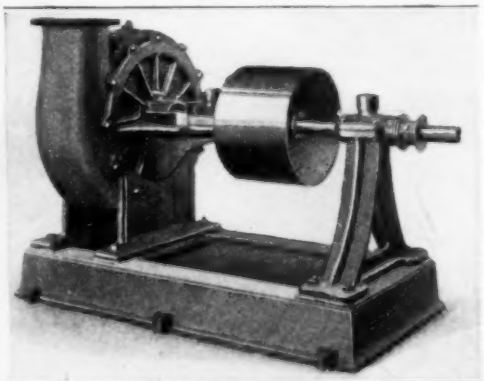
For ordinary working a French telegraph office has managed to dispense with the troublesome battery cells commonly used, by substituting a three-cathode mercury rectifier, taking current through star-connected transformers from a three-phase alternating-current line. A storage battery is connected between the transformer neutral and the rectifier cathode and is slowly charged, becoming available for emergency use. Any voltage drop, or reversal at the rectifier, actuates an automatic cut-out and flashes a red lamp, enabling the attendant to prepare an auxiliary battery if necessitated by long-continued trouble.

TWELVE-MILE SHAFT PROPOSED BY ENGLISH SCIENTIST

What lies a few miles underneath the earth's surface is a mystery, indefinitely explained by various theories, but unsolved so far as actual subterranean exploration is concerned, for the deepest shaft in existence is only slightly more than a mile and a half in depth. Seeking an answer to this puzzling question, an eminent English engineer proposes to obtain practical information by digging a 12-mile shaft, for which he has drawn complete plans. In the latter, provision is made for regulating atmospheric pressure in the lower portions of the excavation by the installation of locks at intervals of two or three miles, and there is described a somewhat complicated device for removing heated air from the same sections. It is believed possible that such a shaft would tap a reservoir of high-pressure steam, or lead to the discovery of valuable mineral deposits.

ADJUSTABLE SAND PUMP HAS INTERCHANGEABLE PARTS

Contractors working on a seawall along the Gulf coast have developed a type of rotary pump for sand and gravel in which are incorporated a number of improvements. By turning the drum between the side plates, the direction of discharge may be set at any angle desired. A renewable portion inside the casing takes all the wear of the discharge, which becomes excessive when working with semisolid materials. The sides and drum are readily removed and interchanged or renewed,



New Form of Rotary Pump for Sand and Gravel, with Parts Interchangeable and Renewable for Wear

and the shaft is made the same at both ends, so that it can be reversed to reduce wear. Ball bearings take up end thrust.

PERHAPS MARS IS SIGNALING EARTH

Receipt of Strange Wireless Waves Revives Interest in Interplanetary Communication

By PAUL H. WOODRUFF

DURING the latter part of January, Marconi commercial-wireless stations at New York and London reported the receipt of certain strange and undecipherable signals. The only character at all recognizable was a three-dot unit resembling the Morse letter "S." Comparison of records established the fact that the two stations, though thousands of miles apart, heard the signals simultaneously, and with equal power, and that the messages, if such they were, had a regularity of form that dismissed at once the natural explanation of a static or meteoric origin. Furthermore, the queer impulses were characterized by an extraordinary wave length, 100,000 meters, and were heard at all only because the receiving stations happened to be tuned to that length at the time. The wave length ordinarily used for commercial work does not exceed 24,000 meters.

After painstaking study of these conditions, Guglielmo Marconi, unquestionably an authority on wireless, gave it as his opinion that the signals originated at some point outside the earth, and might signify attempts by the inhabitants of other planets to communicate with this one. At once the scientists of all countries became involved in a discussion really more astronomical than electrical; for few questioned the power of wireless waves to cross the void of space between this world and others. The inevitable division of opinion took triangular form, its three points represented by a considerable group who believe the planet Mars inhabited; by some who prefer to center their hopes upon Venus, and by a few who deny the existence of life on any world but this.

Among the supporters of the Venus theory is Dr. Charles G. Abbot, director of the astrophysical observatory of the Smithsonian Institution. His criticism of Mars is that its temperature is as much as 100° lower than earth's, making it difficult to believe that creatures of the universal carbon-and-water constituency could move and have their being there. Venus' thermometer, on the contrary, stands at about 180°, because of its nearness to the sun, but this condition is tempered by a perpetual cloak of clouds, fending off the hot rays and making habitation possible. This same cloud screen, however, prevents accurate knowledge of the planet's surface. Venus at times approaches to within 25,000,000 miles of earth, while Mars never comes closer than 35,000,000 miles, and will not be so near as that until 1924.

Without expressing preference for either of earth's celestial neighbors, Sir Frank W. Dyson, British astronomer royal, sees nothing incongruous in the report of possible signals from outside regions, and says, indeed, that it is quite conceivable such signals are received here. Just what form the signs might take, and how they would be received, is naturally a matter more for the consideration of wireless experts than of astronomers. The secretary of the Royal Astronomical Society of Great Britain, W. H. Wesley, on the other hand, gives it as the view of many contemporaneous astronomers that there are no intelligent beings on other planets.

Prof. Albert Einstein, famous for his theories, views the occasion from a still different angle. Though quoted as believing in life on other stations of the solar system, he thinks any serious attempt of the Martians or Venusians to signal earth would utilize light rays rather than electric waves, because of the greater

WIRELESS

By Josephine L. Peabody

Reprinted from Popular Mechanics Magazine for April, 1910.

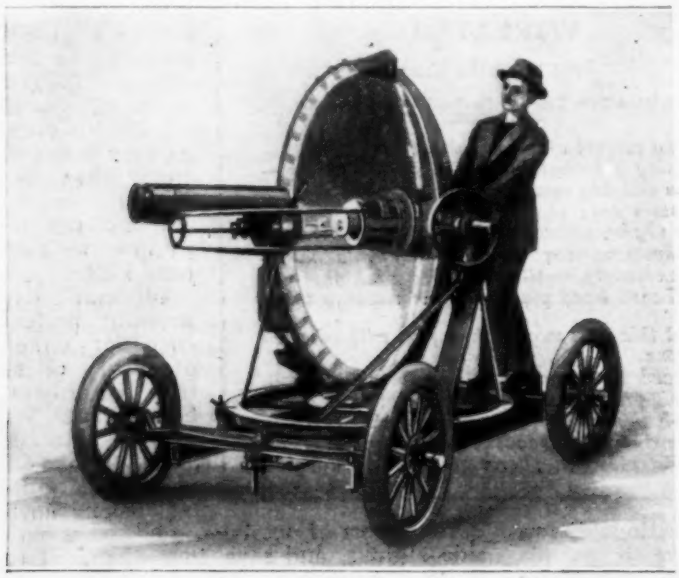
This is a marvel of the universe:
To fling a thought across a stretch of sky—
Some weighty message, or a yearning cry.
It matters not; the elements rehearse
Man's urgent utterance, and his words traverse
The spacious heav'ns like homing birds that fly
Unswervingly, until, upreached on high,
A quickened hand plucks off the message terse.

Toward this man moved since first with whetted stone
He carved strange symbols on the cavern wall,
And proudly turned unto his watching mate.
Through this in travail do his offspring groan
Toward an ideal's love-fraught, imperious call
That bids the spheres become articulate.

ease of control. Therefore the Marconi signals, in his estimation, have some other explanation.

Two of Italy's scientists express exactly opposite views, not only about the strange signals, but on the whole subject of interplanetary communication. Father Alfani of Florence, director of the Ximenian observatory, professes an attitude of scorn for the entire controversy. Prof. Domenico Argentieri of Rome, on the contrary, urges careful and persistent observation for further phenomena. He considers the character of the signals received strong evidence of their intelligent source.

So much for the astronomers and physicists. Electrical engineers and experts present a similarly divided front in the discussion. Thomas A. Edison, always among the first to be consulted on such matters, asserts that the sending power available on earth could easily transmit messages to Mars, and assuming the Martians to be at least of equal intelligence, their messages would reach earth with equal ease. But the idea that an advanced state of culture prevails on that island of space is purely fanciful, built upon the fact that the planet is older than earth. The language and habit of thought used, if any, would have been developed in ways so different from those terrestrial that success in communication would depend upon coincidences, too improbable to be fairly reckoned with. Comment on the subject by Dr. Charles P. Steinmetz takes quite a practical turn. That messages could be sent to Mars during its closest approach he holds assured, and though the idea is highly speculative, it is no more so than many of the modern utilities were 50 years ago. Application as intense as that which won the war would, at any rate, settle the controversy one way or the other. Concentration of all the electric power in the country at one point, the construction of a power house covering hundreds of acres and of towers 1,000 ft. high, and the stringing of heavy antenna cables halfway across the continent might accomplish it, at a cost of perhaps $1,000,000,000. The 100,000-meter wave length of the received signals would be quite sufficient, he says, to cross the intervening space, and is about what might be expected in interplanetary communication. Signals either way would have to be by dot and dash, because no other system is possible in telegraphy; so the three dots received by Marconi might be some unknown Martian character. A careful record of all such signs received in the unusual wave length, noting the relative strength at different positions of the planet, would soon establish a certainty as to their source. And of course a repetition of similar signals or characters would prove an intelligent origin. A few years of observation would be adequate to decide these points.

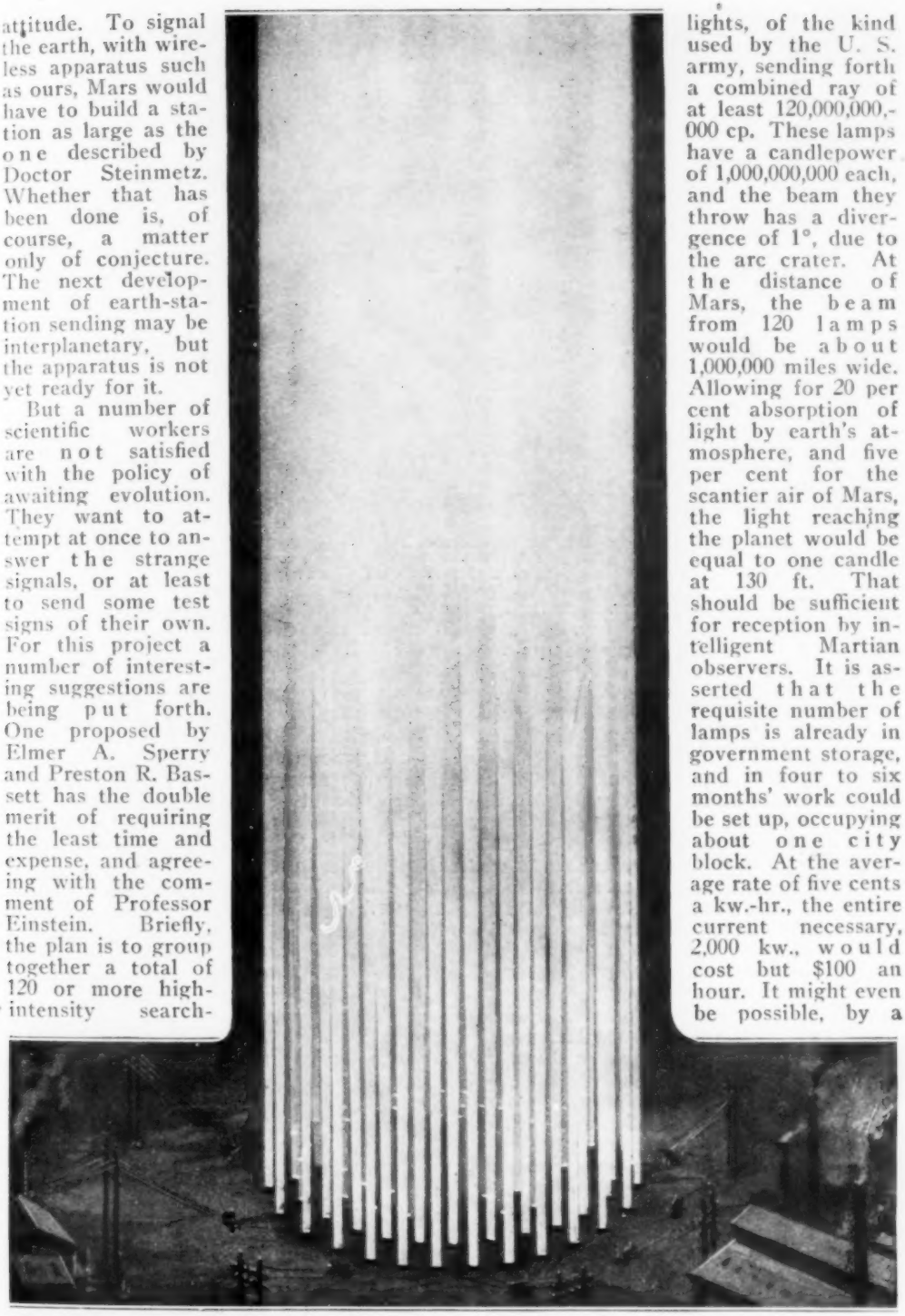


One of the Huge Searchlights, with 60-Inch Reflector, Suggested as Suitable for Signaling to Mars: The Proposal Is to Form a Compact Bank of 120 or More of These 1,000,000,000-Candlepower Lamps, Throwing a Practically Parallel Beam of 120,000,000,000 Candlepower

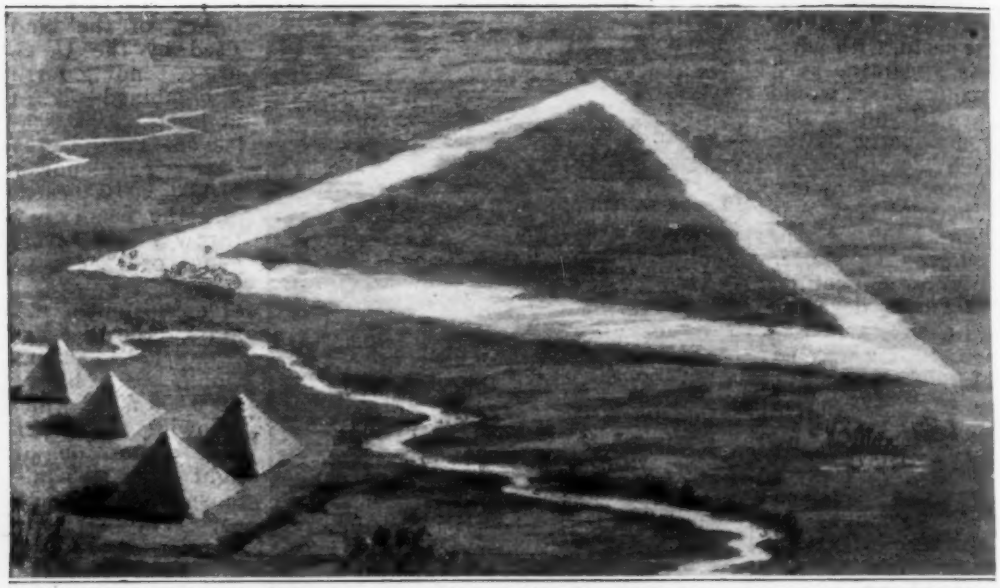
The wireless chief of the French army at Paris, General Ferrie, reports that no unusual sounds have been heard at the Eiffel Tower station. He doubts the ability of earth stations to transmit to Mars, or indeed beyond the upper strata of atmosphere, but does not deny that Martian stations might accomplish what earth stations cannot, at present. When all the important stations here receive simultaneously a definite group of signals, then all, even the skeptics, will bend their energies to solving the mystery. And Commander R. L. McConnell, U. S. radio-supply officer at the New York Navy Yard, takes a similar

attitude. To signal the earth, with wireless apparatus such as ours, Mars would have to build a station as large as the one described by Doctor Steinmetz. Whether that has been done is, of course, a matter only of conjecture. The next development of earth-station sending may be interplanetary, but the apparatus is not yet ready for it.

But a number of scientific workers are not satisfied with the policy of awaiting evolution. They want to attempt at once to answer the strange signals, or at least to send some test signs of their own. For this project a number of interesting suggestions are being put forth. One proposed by Elmer A. Sperry and Preston R. Bassett has the double merit of requiring the least time and expense, and agreeing with the comment of Professor Einstein. Briefly, the plan is to group together a total of 120 or more high-intensity searchlights, of the kind used by the U. S. army, sending forth a combined ray of at least 120,000,000,000 cp. These lamps have a candlepower of 1,000,000,000 each, and the beam they throw has a divergence of 1°, due to the arc crater. At the distance of Mars, the beam from 120 lamps would be about 1,000,000 miles wide. Allowing for 20 per cent absorption of light by earth's atmosphere, and five per cent for the scantier air of Mars, the light reaching the planet would be equal to one candle at 130 ft. That should be sufficient for reception by intelligent Martian observers. It is asserted that the requisite number of lamps is already in government storage, and in four to six months' work could be set up, occupying about one city block. At the average rate of five cents a kw.-hr., the entire current necessary, 2,000 kw., would cost but $100 an hour. It might even be possible, by a



The Proposed Arrangement of at Least 120 Searchlights in Bank would Project a Beam of Light Which would Be 1,000,000 Miles Wide at the Distance of Mars, and Have the Power of One Candle at 130 Feet, Sufficient for Observation by the Martians



Sir Oliver Lodge's Simple Suggestion Is to Form a Gigantic Geometrical Figure on the Surface of the Sahara Desert, Which would Be Visible to a Martian Observer through a Telescope as Powerful as Those Used on Earth. It would be Understood as a Sign Because Geometry Is a Science of the Universe

magnification of the system described in this magazine last December, to send actual conversation over the beam; but there would be no reason to suppose the Martians could interpret it.

Another investigator, however, Prof. Clarence E. Ferree of Bryn Mawr, has other figures for the necessary strength of the light beam. By comparing the point of most distant visibility of a candle with the distance to Mars, he arrives at the enormous sum of 766,000,000,000,000 cp., allowing for various errors and losses. This computation would necessitate some hundreds of thousands of searchlights.

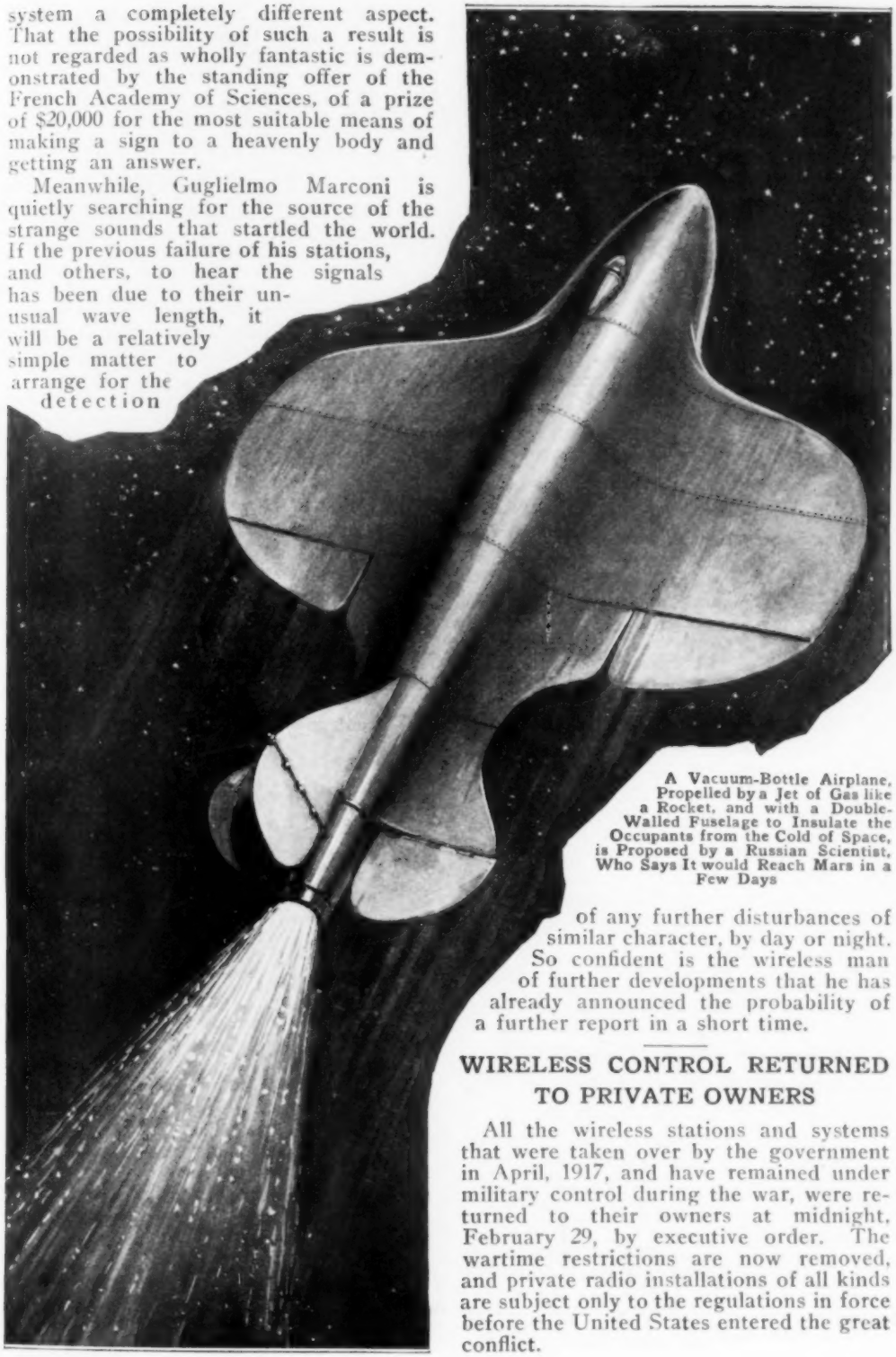
Sir Oliver Lodge contributes to the discussion a proposal of remarkable simplicity and logic. Geometry, he declares, is a science of the universe. A geometrical figure of gigantic size, inscribed upon the surface of the Sahara Desert, would be both visible and intelligible to the Martians, and would doubtless induce them to attempt an answering sign of some kind. Whether it would be possible by this means ultimately to work out a code for actual communication is a complex problem, upon which no suggestions have been made. Since earth is presumably observed from other planets when the sun is shining upon it, and therefore appears as a bright star in the Martian heavens, the figure on the desert might be made of a dead black or light-absorbent substance, appearing then as an "earth spot" of definite character.

Perhaps the most extraordinary suggestion of all is that of Dr. George De Bothezat, Russian scientist and member of the advisory committee on military aeronautics, now conducting air tests near Dayton, Ohio. He proposes to build a plane with a double-walled body, like a gigantic vacuum bottle. In this snug container the passengers would be insulated from the cold of interplanetary space and the heat of atmospheric friction, and could enjoy their oxygen in comfort. Instead of a screw propeller, useless in space, the queer plane would be driven by a jet of gas through a scientifically designed nozzle at the rear, as recently designed in France. Once beyond the atmosphere, the speed would increase enormously, and the trip to Mars or Venus would take but a few days. Within this generation, the inventor believes, interplanetary travel will become a fact—and the people of the most highly developed planet will make the journey first. And even now a volunteer passenger is ready; Capt. Claude R. Collins of Philadelphia offers to make the trip, after communication has actually been established, and an empty plane or rocket has been landed on the other planet, as a preliminary.

The initial communication with another world, if that event ever occurs, is likely to be of the most primitive type; merely a sign and an answering sign. But even that achievement would virtually open an entirely new science, and give the solar

system a completely different aspect. That the possibility of such a result is not regarded as wholly fantastic is demonstrated by the standing offer of the French Academy of Sciences, of a prize of $20,000 for the most suitable means of making a sign to a heavenly body and getting an answer.

Meanwhile, Guglielmo Marconi is quietly searching for the source of the strange sounds that startled the world. If the previous failure of his stations, and others, to hear the signals has been due to their unusual wave length, it will be a relatively simple matter to arrange for the detection of any further disturbances of similar character, by day or night. So confident is the wireless man of further developments that he has already announced the probability of a further report in a short time.



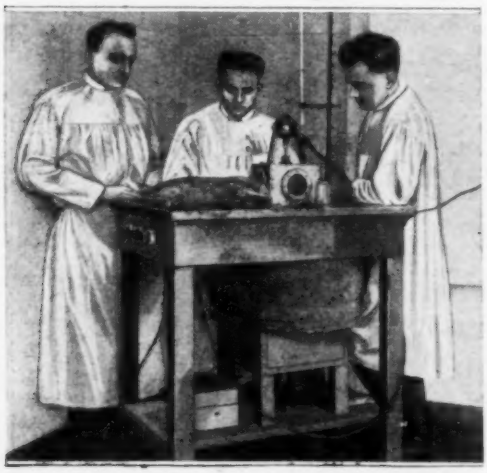
A Vacuum-Bottle Airplane, Propelled by a Jet of Gas like a Rocket, and with a Double-Walled Fuselage to Insulate the Occupants from the Cold of Space, is Proposed by a Russian Scientist, Who Says It would Reach Mars in a Few Days

WIRELESS CONTROL RETURNED TO PRIVATE OWNERS

All the wireless stations and systems that were taken over by the government in April, 1917, and have remained under military control during the war, were returned to their owners at midnight, February 29, by executive order. The wartime restrictions are now removed, and private radio installations of all kinds are subject only to the regulations in force before the United States entered the great conflict.

CAN NOW OPERATE PAINLESSLY ON CONSCIOUS PATIENT

The development of an anæsthetic which produces total and general insensibility to pain without loss of consciousness, even without nausea, is the claim made by a large eastern concern. The new gas is said to be so decidedly harmless that a sufferer may now walk into an operating room, himself apply the mask to his face, observe the amputation of a finger, for instance, and shortly walk out again, little shaken by his experience. As a matter of fact, this thing already has been done, with the exception that the gas was administered by a professional. Teeth are filled, nerves killed, wounds sewed, abscesses treated, etc., in this way with even greater facility. The new gas is said to be ordinary ether, which has been highly refined, and to which has been added certain gases whose nature is not revealed.



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As the New Ether Compound is Inhaled, the Cat Loses All Sensibility to Pain, Though Retaining Full Consciousness Otherwise

RODENTS CLASSED AS VERMIN HELP REPLANT FORESTS

Indiscriminate and immoderate killing of the small animals classed as rodents and regarded as vermin is condemned by the director of a western forestry-experiment station. Observation gives evidence, he declares, that these little creatures, while responsible for a certain amount of destruction, are really helpful in the work of reforestation. A large percentage of the regrowth on burned areas sprouts from the seeds and nuts carefully hidden away by squirrels, mice, and chipmunks.

FLOOD COVERS BIG AMERICAN AUTO PARK AT COBLENZ

To the miseries man has lately contrived for himself, ironic nature recently added in France and Germany the hardship of widespread midwinter floods. Hundreds of small streams, and many of the larger, including the Seine, the Rhone, and the Rhine, left their banks and inundated the countryside. Among the towns to suffer was Coblenz, of American memories. And of particular interest to Americans was the flooding of Lutzel auto park, not far from the heart of the city. Here were parked hundreds of American motor trucks. The flood covered them all.

These American Army Trucks were Submerged When the River Rhine Rose Recently and Flooded Many Parts of Coblenz, Including the Great Auto Park. All of the Trucks were Damaged, and Some Made Worthless by the Immersion

When the Fortunes of the Chase Necessitate the Crossing of This Broad Stream, the Members of a Well-Known Virginia Fox-Hunting Club Make Use of Rafts, Reserved for the Purpose. Above are Seen the "Huntsman," as He is Properly Styled, with His Two "Whippers-In," and a Part of the Pack. The Hounds' Anticipatory Eagerness Makes an Amusing Study for the Dog Fancier

FOX HUNTERS AND PACK CROSS STREAM ON RAFTS

Few regions of Europe and the Americas have proved congenial for the old and colorful English sport of fox hunting. Only in the southern and eastern United States has fox hunting flourished, outside the British Isles, in anything like the traditional style. Here, in southern Pennsylvania, Maryland, and Virginia, the nature of the country has favored the establishment of many clubs, several of them organized in colonial days. And from Virginia comes the interesting photograph on this page. With regard to the group's seemingly incongruous setting, it is explained that the fox was to be "found" this day on land separated from the clubhouse by a broad, sluggish stream. Rafts were necessary, in consequence, to bear the pack and the members of the hunt to the chosen spot. In the picture is shown the vanguard, consisting of the scarlet-coated "huntsman," with his two "whippers-in," and a few of the hounds.

¶To reduce fire danger, by making quick communication possible between patrol stations, 400 miles of telephone lines will be installed in Canadian timber lands.

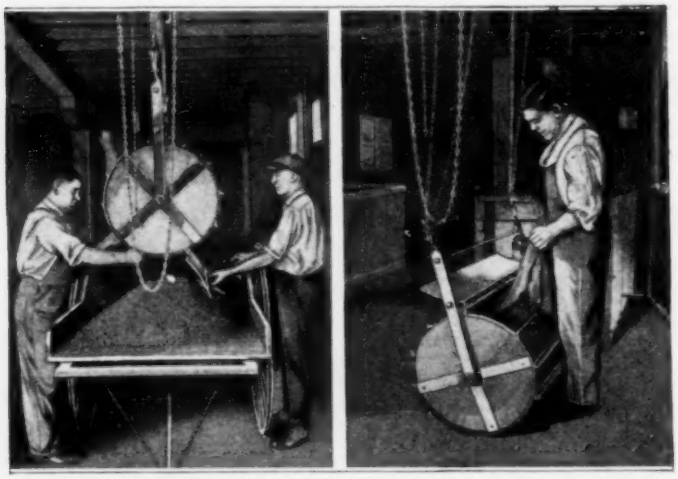
GERM-KILLING AIR INJECTED INTO NOSE BY NEW DEVICE

Self-administered remedial or preventive treatment for diseases of the nose and throat is made possible by a simple instrument now available. A nickelplated cylinder, containing a roll of cotton gauze, and having attached to it three short tubes, composes the device. By pouring a few drops of a specially prepared germicidal oil on the gauze, inserting two of the tubes in the nostrils, and the third in the mouth, medicated air can be blown into the nasal cavity by the user of the contrivance.

A New Medicated Inhaler: Seen in Use at the Left, and in Detail with Its Case at the Right. Two Tubes Are for the Nostrils, One for the Mouth

DRUM ROTATED IN HOT WATER TAKES SMUT OUT OF WHEAT

Wheat smut may be eradicated by hot-water treatment, and the only difficulty is the labor of bathing the grain. An Indiana county agent has greatly simplified the process by arranging a galvanized-iron drum of 5-bu. capacity, on a horizontal shaft, so that it can be lowered into a water tank. After soaking for five hours in cold water, the wheat is placed in the drum and bathed for one minute in water at 120° F. Then it is lifted out, the water heated to 129,° and the bath resumed for 10 minutes. After partial drying, the swollen grain is planted with an oat drill. Farms using wheat so treated show a crop improvement of 11.1 per cent.



At the Left, Emptying the Treated Wheat Out of the Drum into a Wagon; at the Right, Filling the Drum from Bags before Hoisting It into the Tanks in the Background

¶Installation of libraries on all ships of the United States merchant marine, and in all coast-guard stations and lighthouses, is an item of the comprehensive plan recently announced by the American Library Association.

MESOPOTAMIAN RAILWAY LINK FROM BAGDAD TO BUSRAH

Completion of the last link of 164 miles between Hilla and Ur Junction, on the Euphrates River in Mesopotamia, gives a through railroad route of 352 miles between Bagdad and Busrah. Work on this link has progressed at the rate of 1½ miles a day. The new line is of 39⅜ in., or meter gauge, necessitating the conversion of the 58-mile link from Hilla to Bagdad, which was standard gauge, by moving one rail. At first one train a day will run over the route, with a passenger schedule of 28 hours and a freight schedule of about 48. After the installation of modern rolling stock, a 12-hour running time may become possible. The line taps a particularly fertile and productive region south of Bagdad.

ELECTRICITY, NOT EXPLOSIVES, LIKELY TO WIN NEXT WAR

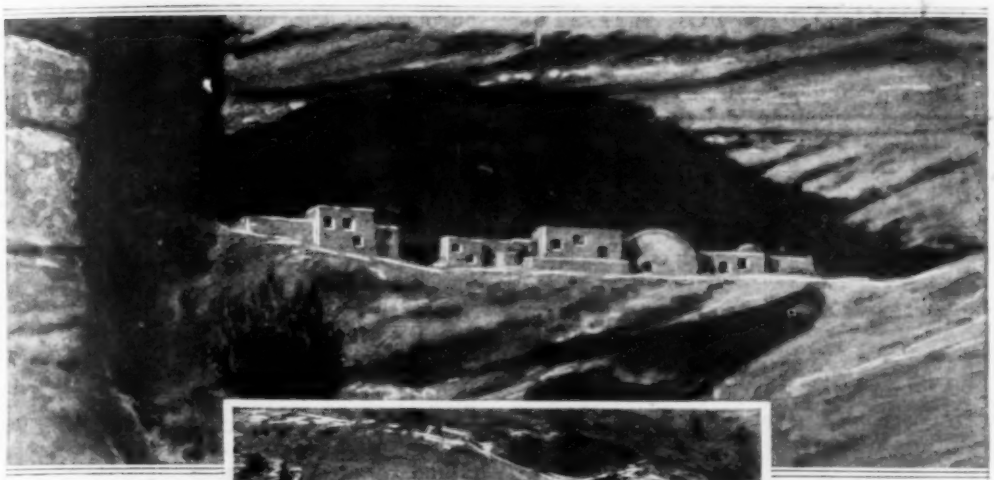
That the use of high explosives in modern warfare has about reached the end of its development, is the opinion of a French inventor of one powerful compound of that nature. Neither can poisonous gases, it is indicated, be made much more dangerous than were those contrived in the World War. Flying mechanisms of various types promise much greater menace, and it is probable that any new developments in scientific warfare visible in the next international disagreement will be electrical in their nature. Electricity's use in the last war was relatively small.

CAMERA'S EYE DISCOVERS ANCIENT RUINS

By FREDERICK KINNEY

STRANGE secrets of antiquity, tucked away in a cavern high up on the face of an unscalable precipice, and only surmised even with the aid of powerful glasses, have just been discovered and recorded for study by an extraordinary use of modern photographic methods. The find, which has delighted archæologists, consists of an entire community of prehistoric dwellings, preserved from injury by their very inaccessibility. The cliff in whose unexplored caverns these ancient troglodytes had their homes rises a sheer 3,000 ft. from the floor of Zion Cañon, in southern Utah.

To add to the interest of the event, the



The Ruins as They Appeared in the Photographic Enlargement

With This as a Guide, the Archæologists Constructed Clay Models

Above Is the Picture Taken by the Telephoto Camera Seen at the Right. The Arrow in the View Indicates the Ruins

discovery was practically accidental. Distances are long in the mountain parks, and the photographer, seeking scenic features, armed himself with a telephoto camera of the type developed by war needs. From another cliff, three quarters of a mile away, the mysterious cave revealed to the eye only a faint outline of possible ruins. An exposure was made, but when it was developed, it was found that even the great magnifying power of the telescopic lens left the image too small for analysis. So an enlargement was made, and from that another, and so on until the final print represented four successive steps to greater size. On this, the city of prehistoric days became distinctly visible in all its detail. Archæologists viewed it, found in it new knowledge of forgotten ages, and proceeded to construct, with its guidance, complete clay models of the original troglodyte dwellings in the isolated cavern.

Attempts to reach it have taken the explorers within 200 ft. of the entrance, by way of a huge shale slide at the foot of the cliff. Beyond that point no one has yet found a way to go, for whatever paths the cliff dwellers used have disappeared. Scientists, however, hope to contrive a way.

STIPPLING PEN FOR ARTISTS RUNS BY CLOCKWORK

The stippling process, by which artists laboriously produce delightful half-tone effects, has been "labor-saved." A London inventor has devised a stippling pen operated by a flexible shaft from clockwork in a box, and so long as the spring is kept wound the stipple action is wholly mechanical. Any desired grade of pen point may be inserted.

With This Machine the Artist's Pen Automatically Produces Stipple Effects. The Pen is Operated through a Flexible Shaft by a Spring-Driven Mechanism in the Box

ROTATION OF CELL SPEEDS UP ELECTROCHEMICAL ANALYSIS

Electrical deposition, as used for chemical analysis, is rather a slow process, but may be speeded up considerably by constant agitation of the electrolyte. In a new form of apparatus this is accomplished by rotating the containing cells, using a 1/32-hp. electric motor for that purpose. Little power is required, and the tiny motor is adequate for several units. Special methods of wiring, and of fastening the electrodes are employed, and the speed of rotation is about 500 r.p.m. With this equipment, four amperes of current for 30 to 40 minutes, in tests, gave a total deposit of .035 oz. of copper or brass alloy.

NEW SPORTING RIFLE RESEMBLES ARMY GUN

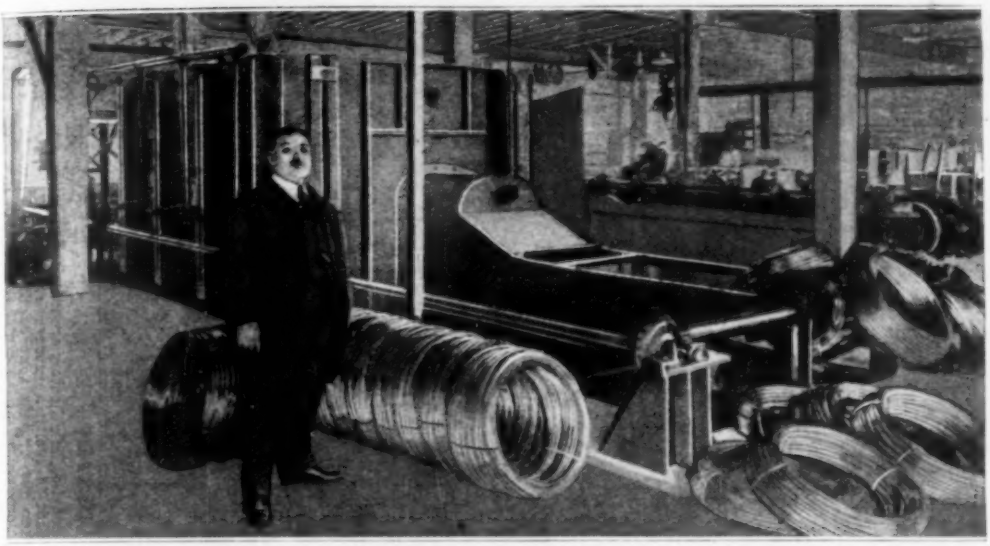
A new .22-caliber bolt-action magazine rifle, with which remarkable records have already been made at Sea Girt and Caldwell, is to be placed on the market, according to announcement, some time this spring. The gun's characteristic most talked of at these national competitions was its resemblance to the regulation U. S. Army service rifle. As the proportions are similar, and the action essentially the same, the military rifleman or cadet is able to practice at reduced ranges, yet under conditions that simulate regular work with the army weapon.

To the well-known army model, however, have been added a number of interesting features. The magazine, for either five or 10 shots, is thrust into the bottom of the receiver, as in an army pistol. To eject the magazine, one presses a convenient button. The rear sight is worth remark, also. It is of the aperture-peep type, and is placed as far as possible to the rear of the receiver, thus promoting accuracy by increasing the distance between sights. The rear sight may be adjusted in total darkness, finally, as each turn of the thumbscrew is announced by a sharp clicking noise. Otherwise, the sight resembles that of the army rifle.

This Photograph was Snapped at the Competition in Which the New Rifle Made Its Record, Scoring 36 Consecutive Bull's-Eyes at 200 Yards

The Detailed View, at the Right, Shows How the Rear Sight has been Placed as Far to the Rear as Possible

The Similarity of the New Rifle and the Regulation Army Gun is Suggested Above. The Rifle Fires Either the .22 Short or the .22 Long Cartridge, from Either a Five or Ten-Shot Magazine



The Discharge End of the Water-Sealed Annealing Furnace is Seen Above. The Conveyor Belt Carries the Coils of Copper Wire through the Gas-Heated Furnace, from Left to Right. The Water Seals, from One of Which the Coils are Seen Emerging, Exclude Outside Air, and So Prevent Oxidation or Discoloration

AIR KEPT OUT OF ANNEALING FURNACE BY WATER SEALS

For the "bright annealing" of copper wire has been developed an interesting gas-heated muffle furnace from which all air is excluded by a clever use of water seals. The function of the furnace is clear when it is explained that the process of drawing wire hardens the copper, increases its tensile strength, and lowers conductivity. After drawing is completed, in consequence, copper wire which is to have the highest conductivity is annealed, or softened by heating. And, if a workmanlike job is to be done, the heating must be effected without the presence of air, which would oxidize, or discolor, the metal. So the new furnace is made air-tight by immersing the entrance and discharge ends in several feet of water. When a batch of wire is to be "bright annealed" the coils are laid on a conveyor belt which carries them into and out of the first water seal, through the gas-heated chambers of the furnace, and finally through the second seal, whence they emerge as bright as new pennies.

¶The color cards of American dyes, issued by an association of textile interests, have now been adopted as standard by a number of domestic industries, schools, libraries, and institutions, indicating a constantly increasing strength of position for the American art.

MOTORCYCLE IS EQUIPPED FOR FRESH-EGG DELIVERY

As a delivery vehicle the sidecar-equipped motorcycle has been employed in the cities for many years and has proved highly efficient in this capacity, but its adoption by the farmer for the same purpose is a comparatively recent development. An English poultryman was among the first to recognize the utility of the machine in his business. With it, he transports fresh eggs to market, quickly and safely, carrying the product in divided trays, which slide into the front of a specially designed sidecar body. Protective mats, placed on top of the trays, prevent breakage when rough roads are traversed.

BY COURTESY OF THE MOTOR CYCLE, LONDON

Transporting Eggs to Market by Motorcycle: An English Poultryman Employs the Machine, Which is Designed Especially for the Purpose

GREAT MIRROR TO BE THEATER DROP CURTAIN

PRE-PERFORMANCE inspection of one's neighbors is to be easy in one English theater, according to the present plan of the manager. He has devised a drop curtain that is really a great mirror, raised and lowered by electric motors. Air cushions will act as shock absorbers, preventing damage when the curtain touches the floor. Glass is probably not the material to be employed, as such a great sheet would be hard to produce and harder to preserve. Use of some nondimming metal is no doubt intended.

COMMENT AND REVIEW

[These pages were printed February 24, 1920]

The Power of Purpose

AS a winter sun was beginning to relent with the approach of spring, there passed away in Washington an American who had written our Nation's name in letters of eternal frost on tablets of crystal ice; and having thus achieved a world's ambition of centuries, he left the Stars and Stripes proudly floating in the unutterable solitude of the North Pole.

Almost a thousand years before Admiral Peary made his first venture into the northern polar field, other adventurous spirits had answered to that same resistless call to come and learn what the great white waste had to tell. For 500 years after the first settlement in Iceland, exploration ceased, and then it awoke courageous men of many countries, who tried each to carry the light of civilization into the long night. The heritage was handed down through 300 years of active exploration in which each new effort sought to advance the line if only a few miles. Of their trials, sufferings, and disappointments these fearless men said but little; often it remained for rescue parties to bring back the account of how they bravely died for a great hope which still lived.

As a young civil engineer in the Navy, Peary had joined in making the survey and plans for the Nicaragua Canal, and revealed his mechanical ability through the invention of a rolling lock gate. It was in 1886, at the age of 31, that he made his first venture into the great snow empire, and there he found a determination to continue the search until the goal was reached. Eight expeditions there were in all; with each came added experience of how to reach the pole, and the greater intensity of purpose to do it. It was the last trip, that of 1908, that crowned his efforts, and on April 6, 1909, with his negro servant and four Esquimos who had accompanied him on the last section of the journey, he reached the pole, and the quest of centuries was ended.

His is an inspiring example, that of undaunted courage and continued effort after repeated hardships and many narrow escapes from death. In years agone others had started out with hopes as high as his, some with even greater confidence in their success. As each expedition left the ship, and perhaps escape behind, he could not have been unmindful of the fate of the more than 700 valiant men who in years past had perished in the same attempt. If departed spirits have influence over mortal mind, one can well picture this noble army of 700 pointing relentlessly toward the North whenever the obstacles were so great as to tempt a looking backward, even in the moment of greatest physical weakness. His ambition was to win a great honor for his country, and to maintain that wonderful tradition of heroism and self-sacrifice which will shine throughout the longest, darkest polar nights of all time.

The discovery of the North Pole was never a thing to be capitalized; for years men had ceased to expect to find there mines of gold or mountains of jewels; it was rather an adventure sacred to science, and a monument to the indomitable spirit of a conqueror and his country.

Fatherless at the age of three, he was a worker all his life; he fought his way up step by step; he did not seek the easy path; he earned each promotion which came to him. Not all our young men need go to a north pole to be of service to country or science, but the same kind of effort which he displayed will bring them also great success even though their names do not shine, as will his, in the Hall of Fame.

Get the Worcester Spirit

DURING the latter part of the past winter New England suffered from an almost unprecedented series of snowstorms, of which three followed in quick succession. Before it was possible to recover from one storm the next appeared until, at the end of the third, city streets were impassable in the greater part of five states. Among the blockaded cities was Worcester, Mass., where traffic of any kind was unable to move. Even the fire department was confined to its stations; and if it had succeeded in turning out, the hydrants were lost in drifts which had frozen into hills of ice with the cold wave which followed a short rain. No such condition had existed in the memory of the oldest citizen. With the labor available to be employed it would have taken weeks to get relief.

Then the mayor called for 10,000 volunteers, men and boys, to offer their services without pay, and dig the city out from this avalanche from the skies. The response was prompt; he not only got his 10,000, but other thousands. Dignified bankers, professional men, merchants, employes in stores, offices, and factories, the university students, and the high-school boys; in fact every able-bodied male turned out. Every truck and team in town—miles of them—appeared in a great snow-fighting army. The endeavor of each seemed to be, not how little, but how much he could do. The organization had been quickly but well planned. There was no lost motion; there were no jealousies as to who was getting the most credit. At frequent intervals the hot-coffee wagons made their rounds, while the snow and ice steadily disappeared like a young wheat field before a cloud of grasshoppers.

It was a weary army when the task was completed at sundown; there were thousands of lame backs and arms; hands more accustomed to the pen than the pick were blistered and bleeding, but the Worcester spirit was undaunted. No need for curfew to ring that night; the theaters and streets were deserted; the "early to bed" was universally observed, but it was a glorious day.

Aside from all advantages of restoring the commercial activities of a great city there was the immeasurably greater advantage which comes from the individual consciousness of having done one's part toward the common good, and the satisfaction of sharing and demonstrating civic duty and civic pride. By the time these lines can be read the grass will be getting green in the Worcester parks, and the event will almost be forgotten, but through months and years will the lesson taught and learned by this event continue to live in the minds of its citizens, with a new-born public spirit and pride in their city; an asset worth many times the cost in mere dollars of removing the work of twenty snowstorms.

The Government in Business

WITH the exception of some politicians and a minority of the railway employes, few desire the continued operation of our railroads by the Government. Before these pages reach our readers the railroads will undoubtedly have been turned back to their owners. The experiment, which has been both costly and very unsatisfactory, may ultimately, however, be worth the cost, as a demonstration of how not to do it. It is to be hoped the country at large may receive at least this much benefit. Looking back, it is difficult to see in what single respect the taking over of the railroads, which was done under the excuse of a war necessity, has accomplished any advantage over what the railroads would themselves have furnished if left alone. Our railroad system was the most perfect in the world, and had been so for years. To this country came the railroad builders and managers of every country that had a railroad, or wanted one, to learn. Our traffic service, both freight and passenger, was the marvel of shippers and travelers in all lands. All the Government has ever had to do since the Civil War was to name its requirements to a railroad manager and nothing was permitted to have precedence. In fact, on the day the roads were taken over, the railroads had so filled the docks and switch yards of our Atlantic ports there was scarcely room for another freight car. At no time since has the Government been able to do as much for itself, in the same number of days. There is only one thing the Government was able to accomplish which the roads had not done, and that was the pooling system, which the roads did not do because Federal restrictions had imposed the most drastic penalties against pooling.

From the first day, business and travel suffered inexpressible losses. While we were in the war the public uttered no complaint; it was supposed to be necessary and therefore patriotic, and the public endured cheerfully. With the actual ending of the war 15 months ago, relief was promised, but even today both freight and passenger service is incomparably inferior to pre-war conditions. Freight takes from two to three times as long in transit; it is almost impossible to trace a lost car: nobody knows and nobody seems to care much. The alleged "public be damned" of 30 years ago was a de-luxe service to what we have had the past year. The polite and painstaking employe of former days has for the most part absorbed a general spirit of indifference into which the Government employe so easily drifts. You and I both know pronounced exceptions to this rule, but in the

main the indictment is correct. It is the inevitable result of employes having no immediate "boss" to hold them true to form. The same would soon be true of any corporation or factory, if its chief management were a thousand miles away and no one on the job with authority to act. As soon as Government takes control of anything, it immediately becomes enmeshed in red tape, and red tape is unspeakably expensive. The direct, short cut to results, the act of initiative which does the necessary thing, without waiting days for the O. K. of some far-away official whose desk pigeonholes are already bulging, is impossible. No matter what the importance, it must wait official sanction from some bureau which works short hours and has numerous holidays and sick leaves. As an example of former railroad efficiency, I remember making a business call on the late George B. Harris, then president of the C., B. & Q. R. R. He sat very straight in a low-backed chair at a plain table, on the other side of which were three similar chairs. Upon the table was a plain inkstand, a pen, and a blotter. This was his entire office equipment, but he did things, and did them *"now."*

The traveling public probably never rode in as many cold sleepers and filthy day coaches, nor rode as many miles standing in the aisles, in all the past 20 years as it has the past 12 months. Never were so many worn-out locomotives in service, or out of repair; never so many bad-order freight cars; and never so great a demand with a corresponding short supply. The morale has not suffered to quite the same extent, thanks to long years of training, but that is on the down grade, too.

And for all this inefficiency, in peace time, the Government admits a loss of something like $700,000,000 for the past 12 months. If necessary repairs had been made, this amount would be several times the amount stated.

There are some things, admittedly, which the Federal Government can alone do, effectively. But enforcement of national law, and operation or even direction, of national business, is quite another.

The National Defense, the National Health, and similar functions will have to be administered by the Government. These will be expensive but are unavoidable. But it should stop there and let Business run itself with only the fewest and absolutely necessary restrictions. The demonstration of the Government trying to run the railroads should be sufficient to satisfy and convince the most radical exponent of the Government in business, and if we are willing to learn, once for all, from the costly lesson of the Railroad Administration, the billions it has cost may, in the end, prove to have been not a total loss.

H. H. WINDSOR

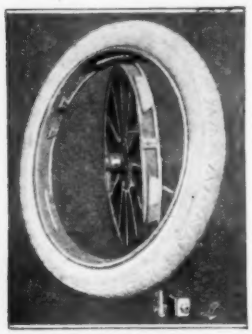
THIRTY-MILE RIVER ROUTE USED BY RURAL MAIL

The most picturesque rural mail route in Oregon is a 30-mile stretch of the Rogue River, which empties into the Pacific near the state's southern boundary. A motorboat is the carrier's "mail wagon," and in it he makes the 60-mile journey every other day. Wooden uprights at the river's edge hold the mail boxes, into which the carrier can often throw the letter or paper without stopping his craft. To make this nonstop delivery possible the year around, the carrier's clientele obligingly move the posts farther into the stream during summertime's low water, and back again during the floods of spring.

The Motorboat, Seen Above on the Waters of the Rogue River, Oregon, Is in the Service of the Post Office Department. Every Other Day the Aquatic Postman Delivers the Mail from the River's Mouth to a Point 30 Miles Upstream

ONE NUT HOLDS IN PLACE NEW DEMOUNTABLE RIM

A demountable rim that is fixed to the automobile wheel by the adjustment of a single nut, is a recent invention shortly to be promoted by an eastern organization. To obtain this facile but certain binding action, the inventor has slotted the wheel felloes, and provided the inner circumference of the rim with corresponding projections. To put on a tire, the motorist places the rim on the wheel, and simply moves one upon the other, to right or left. In this engaged position he locks the two by means of a clip which slips over a bolt projecting from the wheel. The clip is held by a single nut.



MOTOR TRUCK TURNS TRACTOR TO SAVE WHEAT CROP

Coöperation between a motor-truck dealer of Topeka, Kan., and a perplexed farmer of a near-by township last autumn saved, at the eleventh hour, 66 acres of wheat that had been given up for lost. Storms had badly tangled the now mature crop. Worst of all, tractors were unprocurable, horses were scarce, and the few available animals could work in the intense heat but a few hours at a time. As the farmer, with circumstances thus against him, was preparing to write the crop off as a dead loss, the truck dealer made his generous offer. It was accepted. The dealer's two-ton truck was hitched to the farmer's nine-foot binder, and the matted wheat was harvested in record time.

AERIAL CIRCUIT OF ATLANTIC GAINS ATTENTION OF AIRMEN

To approximately 400 aeronautical clubs of the Americas, Europe, and the British Isles, has been referred for their approval a plan for an aerial circuit of the Atlantic Ocean. Tentative rules drawn up by the Contest Committee of the Aero Club of America are rather similar to the rules governing the proposed race around the world, providing that either airplanes or dirigibles may be used, that a competitor will be penalized if he travels by other than air craft for more than 15 per cent of the total distance, etc. The itinerary calls for a start from New York or Atlantic City, and stops at Cuba, Venezuela, Brazil, Africa, Portugal, France, England, Sweden, Norway, Greenland, and Newfoundland.

¶Aboard the ocean liner "Imperator," on its recent departure from Southampton, England, for New York City, was a small branch of a London city bank. This first experiment in transatlantic banking was made necessary by present complications of international exchange. It is proving itself a great convenience to passengers.

The Improvised Tractor is Starting, Above, on Its Unusual Task. The Two-Ton Truck was Offered by a City Dealer, as, with Tractors and Horses Unavailable, the Farmer was Reconciling Himself to the Loss of 66 Acres of Fine Kansas Wheat. With Skid Chains on the Rear Wheels the Truck Pulled the Binder Easily

The Bottles were Decapped, Then Placed Upside Down in the Rack. Gurgling from the Containers, the Beer Flowed down the Troughs to the Sewer Manhole at the Extreme Right. The 86,000 Bottles Emptied on This Day Represented Only a Fraction of the Number Confiscated by the Unsleeping Police Force of Zion City

INTERCEPTED BEER RUNS DOWN SUBURBAN SEWER

Etymologists suggest that the word "zion" comes from the Hebrew syllable meaning "to be dry." This derivation will probably receive popular approval when it becomes known that 86,000 bottles of beer, a fluid of considerable antiquarian value, were recently emptied into a sewer at Zion City, Ill. The bottles were the fruit of a vigorous campaign waged by local sleuths against the many smugglers who attempted to carry the forbidden cargo, in auto trucks and by night, from humid Milwaukee to arid Chicago.

FRENCH BATTLE-FIELD HOTELS SOON TO OPEN FOR TOURISTS

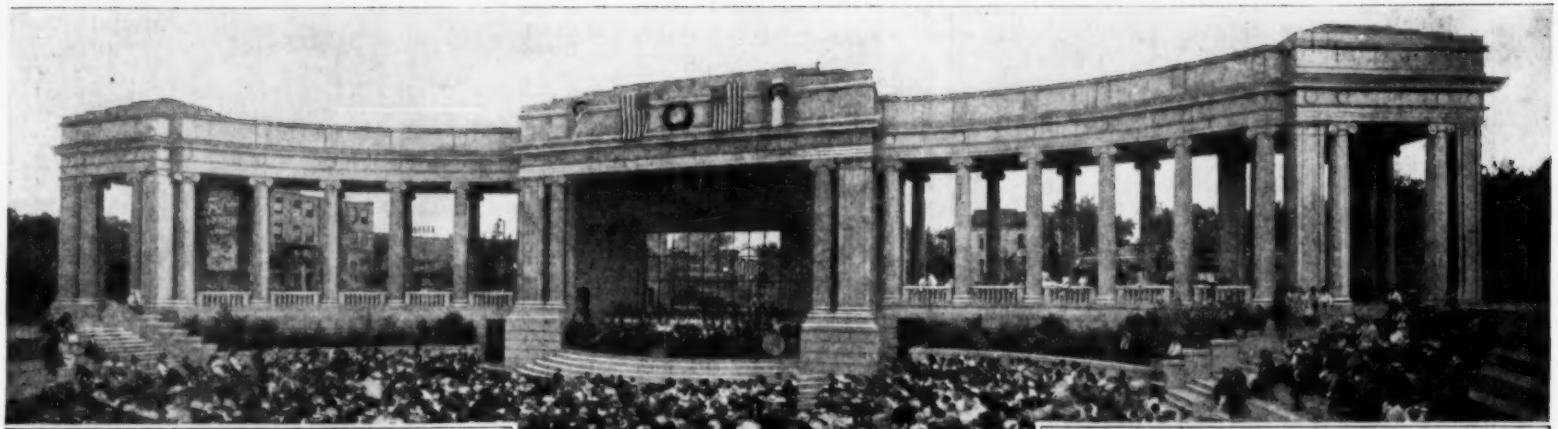
The tourist who contemplates a trip to French battle fields will soon be able to get all needful information at New York, London, Paris, and almost every other capital city, if present plans of the French government are carried out. Arriving at Havre, Bordeaux, Marseilles, or other French port, the tourist will be supplied with more detailed information concerning trains and excursions. Some of these trips will carry him to prominent resorts; most will take him to large hotels, now building, in the hearts of the various battle areas. Radiating from these hotels as centers will run well organized bus and auto lines.

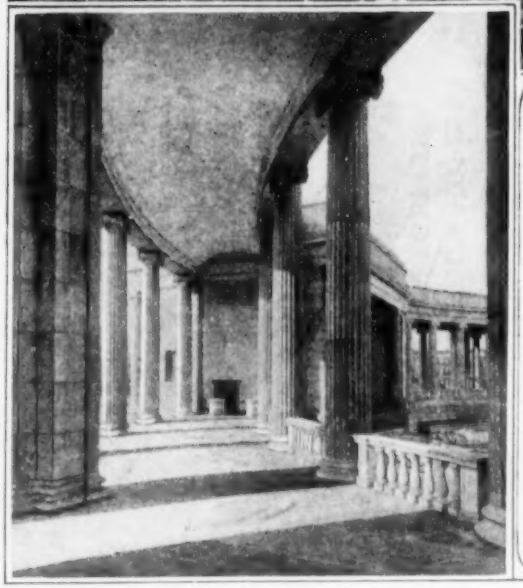
PIPE SPRINKLER ON BRIDGE ELIMINATES WATERING CART

That the wooden floor of the bridge over the Mississippi between St. Louis and Venice, Ill., may be kept wet during the summer, without the use of a traffic-blocking water cart, there has been installed a novel sprinkler system. A four-inch pipe has been laid behind and above the outer guard timber of each roadway. Along the 7,000-ft. length of each of these mains have been inserted 14 valves, each admitting water to 500 ft. of ½-in. sprinkler pipe. Jets from the nozzles in these

This View along the Roadway of the Long Bridge between St. Louis and Venice, Illinois, Shows the Wooden Floor, and the New Sprinkler System Installed to Flush It during the Summer

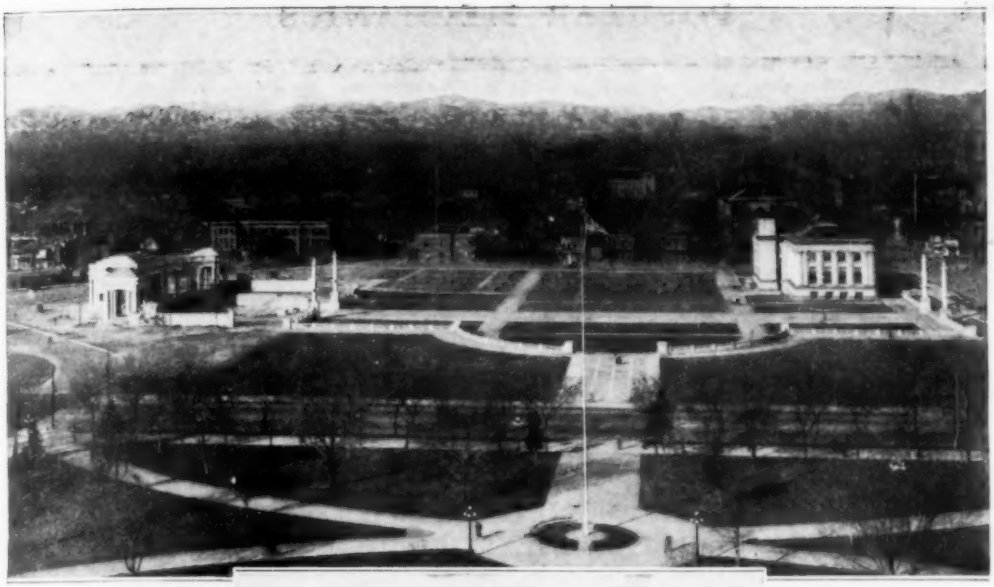
pipes are so crossed that every bit of the floor surface is covered.



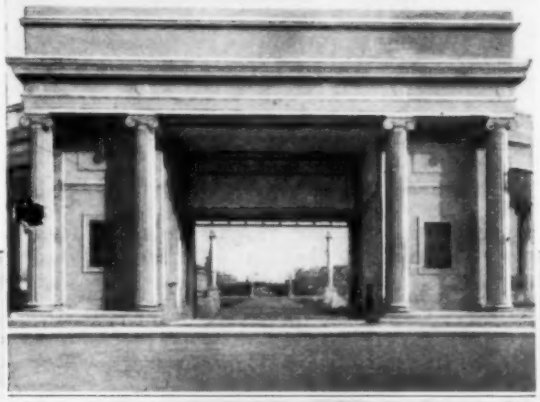


GREEK THEATER IS PART OF CIVIC CENTER

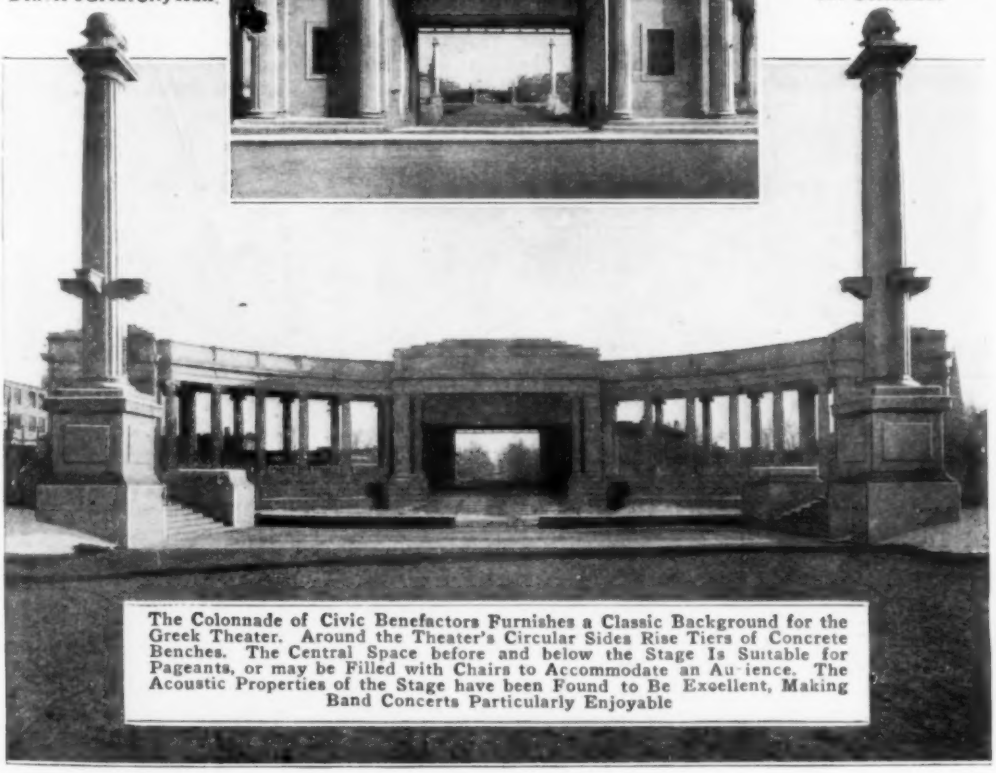
THE dominating feature of Denver's 13-acre Civic Center, laid out in the shadow of Colorado's State capitol, is the open-air theater. Here, in the evenings, when the weather is fair, thousands of people gather to be instructed by speeches and debates, or entertained by band concerts and other performances. Half encircling the theater is the Colonnade of Civic Benefactors, beautiful in appearance and notable in purpose. The colonnade is the local hall of fame; on its stately columns will be inscribed the names of all local citizens, living or dead, who have increased, by substantial contributions, the beauty and culture of the city. Already this stimulus has resulted in benefactions that total many hundred thousands of dollars. One of the latest of these gifts, shown at the right, takes the form of a marble statue, eight feet high, portraying Wynken, Blynken, and Nod, of nursery fame. It will be placed on a grassy plot near the colonnade, some time this spring. A more detailed view of the colonnade is shown at the left. Electric bulbs, concealed about the structure, flood the columns with a subdued and pleasant light at night.



From the Dome of the State Capitol, One Sees the Open-Air Theater and the City Library, as Above. Adjoining the Theater and Facing the Library, is Soon to Stand an Art Museum. At the Spot Indicated by the Tip of the Flagpole is Some Day to Rise Denver's Great City Hall



The Rear of the Colonnade of Civic Benefactors is Pictured at the Left. Glancing Thus across the Stage, in the Fall of 1920, One will See in the Distance the Civic Center's Monumental Gateway, Similar in Design and Dimensions to the Present Colonnade



The Colonnade of Civic Benefactors Furnishes a Classic Background for the Greek Theater. Around the Theater's Circular Sides Rise Tiers of Concrete Benches. The Central Space before and below the Stage Is Suitable for Pageants, or may be Filled with Chairs to Accommodate an Au dience. The Acoustic Properties of the Stage have been Found to Be Excellent, Making Band Concerts Particularly Enjoyable

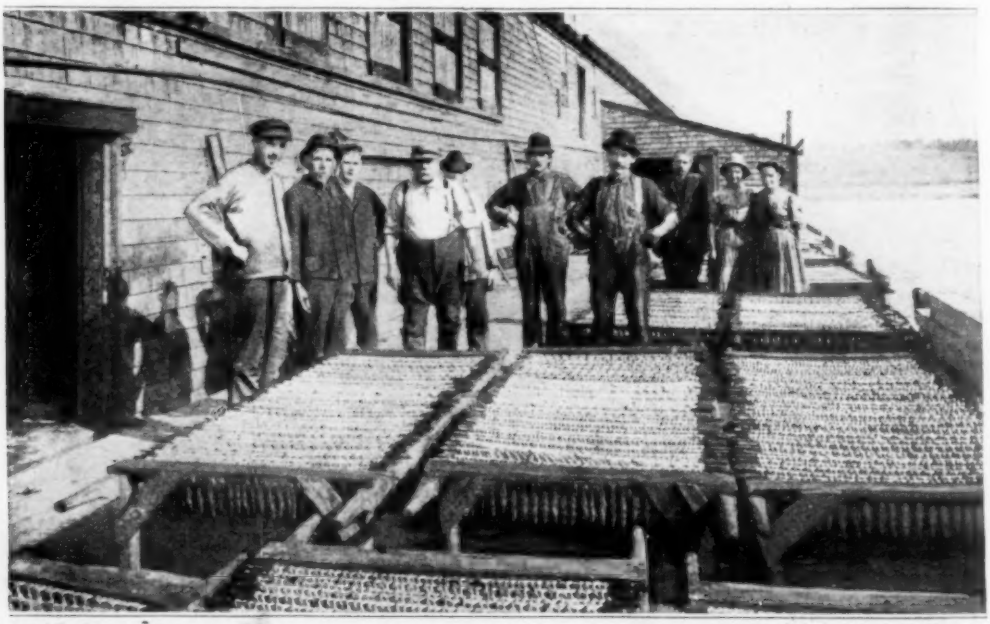
This Classic Edifice will be Remembered as the French Building, by Those Who Visited the Panama-Pacific International Exposition of 1915. An Exact Duplicate of This Structure will be Erected in San Francisco as California's Memorial to Its Soldiers and Sailors of the World War

CALIFORNIA'S WAR MEMORIAL TO RESEMBLE FAMOUS PALACE

A magnificent memorial to California men who fought in the World War is shortly to be the gift of a family prominent in the affairs of the state. It is to take the form of a classic temple, 256 ft. wide and 349 ft. long, costing $500,000, and located on an elevation that commands a splendid view of San Francisco and the contiguous waters. The building will serve as the city's largest museum of the fine arts. In design, the structure will be an exact duplicate of the French building of the Panama-Pacific Exposition, which, in turn, was a replica of the historic headquarters of the Legion of Honor. Incidentally, this choice of design appears to have pleased the French government, as it has announced its intention of donating 80 paintings as a nucleus for a French exhibit.

PRIMITIVE METHODS EMPLOYED BY HERRING SMOKERS

Born over a century ago, the smoked-herring industry is now one of the most important on the northeastern coast, though the methods used in preparing the product for market have undergone



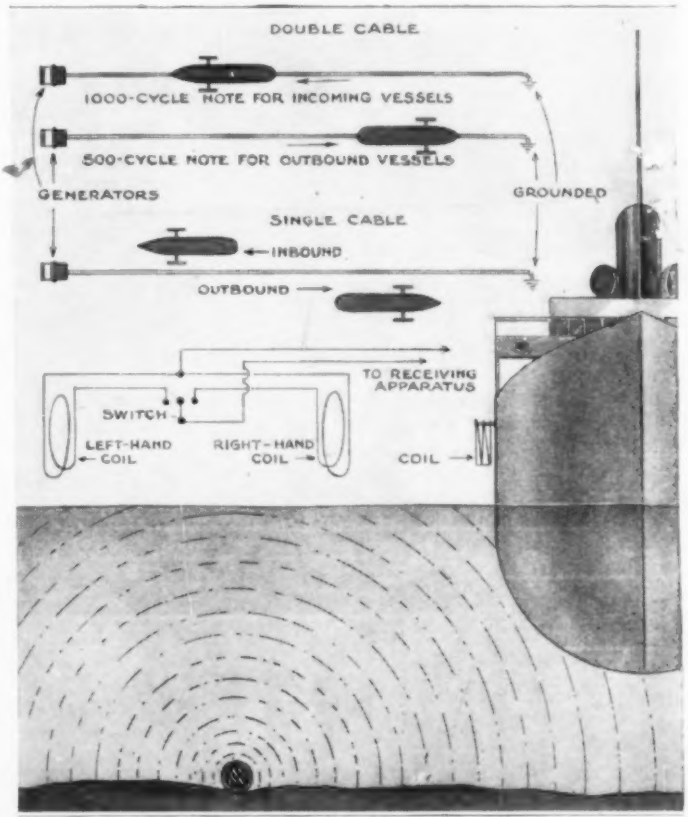
Preparation of Smoked Herring: In the Picture, the Fish are being Dried; Later the Wooden Horses will be Moved into the Smokehouse, Which can be Seen on the Left, and Cured over a Damp-Wood Fire

few changes since the first plant began operations. Men, women, and boys are employed in the smokehouses, which are large frame buildings, located on the wharves where fishing boats discharge their cargoes. Immediately after the herring are unloaded, they are strung on long, pointed sticks, each one of which holds from 25 to 35 fish. Approximately 1,000 of these skewers can be filled in a day by the average worker. The loaded sticks are dipped into brine, and then placed on wooden horses, where they are allowed to remain in the open air until the fish are dry enough to be placed in the smokehouse. Damp wood is burned in the latter. When the curing process has been completed, the herring are packed in boxes. In some cases, the skins, heads, tails, and bones are removed before the commodity is considered ready for shipment.

SUBMERGED INDUCTION CABLE STEERS SHIPS TO HARBOR

Bringing a ship into harbor in a heavy fog is a risky undertaking, even with the wisest of helmsmen. Ordinary caution counsels delay, and the amount of time habitually lost by this cause is enormous. Sound waves caught in the air are wholly unreliable guides, as anyone knows who has run for a train going the wrong way. But sound waves registered by sensitive and adjustable instruments have quite another character. A newly devised induction system now makes it possible for a pilot to pick his ship's way into port in perfect safety, even though blindfolded.

The secret of the novel improvement just disclosed lies in the use of two submarine cables, or in some cases only one, laid along the bottom of the channel traversed by the ships. Through this cable system flows continuously an alternating current of a frequency within the range of audibility—say, 500 to 1,000 cycles a second. Each vessel is fitted with two coils of wire, one at each side, their windings parallel with the keel. As long as the vessel is reasonably near the submerged cable, tiny currents are induced in the coils, pass through an amplifier, and then go to the pilot's telephone. When two cables are used, different frequencies are employed, the higher tone for incoming and the lower for outgoing ships. A switch enables the coils to be connected alternately in circuit, so that the pilot knows exactly whether he is on the right, the left, or directly over the cable. In the case of a single cable, he simply keeps to the right coming in, and to the left going out, by comparing the induced sounds of the two coils. Guided by these characteristic tones, his course along the proper channel is assured.



The Plan Diagram at the Top Indicates the Course of Incoming and Outgoing Ships, Guided by Induction from the Cables on the Bottom. In the Center Is the Wiring Diagram of Coils and Switch. At the Bottom, the Cable Cross Section Shows Radiating Waves Affecting the Ship's Coils

TWO PURPOSES SERVED BY NEW LIGHTING FIXTURE

Ingeniously combined in a single attractive lighting fixture, now being manufactured by a western electrical-supply

Combination Chandelier and Reading Lamp: A Concealed Reel, Operated by a Spring, Holds the Cord of the Adjustable Center Light

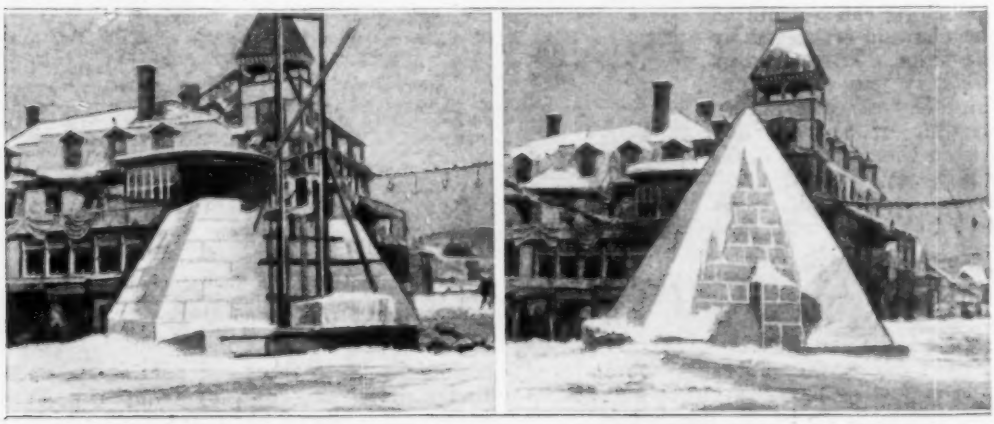
company, are a chandelier, suitable for illuminating a room, and a convenient reading lamp. Four shaded lights are arranged underneath an ornamental plate, which is suspended by chains. A long cord, wound on a concealed spring-operated reel, is attached to the central light, which can be drawn down to a point directly over a desk or table.

CELLULOSE CONTENT OF FIBER FOUND WITH NEW SOLVENT

A new solvent for cellulose, discovered in a western-university laboratory, opens an unexplored avenue of investigation, by making it possible to gauge the amount of cellulose contained in various fibers. Great quantities of this material are now lost in wood waste and straw. Studies of the complex chemistry of this widely distributed substance are now being made, and a hydrocellulose has been formed, by treating cellulose to a process of decomposition, which is found to be more sensitive to chemical reaction than ordinary forms. The great value of many present combinations of cellulose, as in explosives, films, alcohols, and artificial leathers and silks, suggests interesting possibilities in the new work.

ILLUMINATED PYRAMID OF ICE BUILT FOR CARNIVAL

Patterned after Egypt's famous tombs, but constructed with the building material of the Eskimo, a pyramid of ice, erected at Saranac Lake, N. Y., as a decoration for this year's Adirondack Midwinter Carnival, was a beautiful sight at night, when a collection of electric bulbs, inclosed by its crystal walls, were put into operation. Shining through the translucent sides of the novel structure, the lamps illuminated it from base to apex, producing an effect both pleasing and unusual. The blocks of ice utilized by the builders of the pyramid were lifted into place with an improvised hoist, operated by a team of horses, and laid in the same manner as brick or stone.



Ice Pyramid at Saranac Lake, New York: Inside the Structure were Placed Electric Lamps, with Which It was Illuminated at Night. The Hoist Used by the Builders is Shown at the Left. On the Right the Pyramid is Shown as It Appeared after a Snowstorm

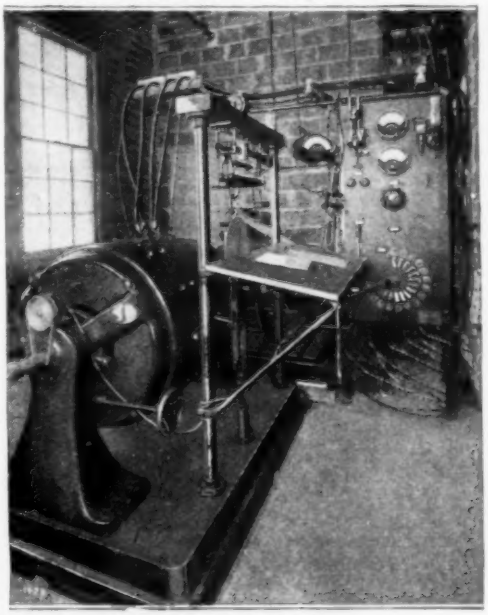
TRACTOR TESTING REQUIRED IN NEBRASKA

The Tractor at the Right is Undergoing
Its Field Tests at the Nebraska Rating Station.
The Chassis at the Left Mounts a Big Electric Generator

Facts, not promises, will be studied hereafter by the Nebraska farmer who is preparing to buy a tractor. For the state has decreed that all tractor types to be sold within its boundaries must first undergo official tests to determine their actual ratings. Reports of these tests will be at the disposal of the prospective purchaser, who will thus be enabled to make an intelligent choice. Necessary buildings and machinery have now been completed by the state, and a few preliminary tests run last winter. With the coming of spring, all types and makes of tractors in local use will be rated.

In all, nine tests are given in the course of the searching examination; of these a typical few will be mentioned. The brake horsepower, at rated speed and with corresponding fuel consumption, is determined in the test building after a run of two hours. The drawbar-horsepower test, at rated load, will be run for 10 hours over a half-mile cinder track; this will show whether the tractor can stand up under a continuous load. The maximum drawbar-horsepower test consists of a series of 50-ft. runs, the load being increased each time until the engine is palpably overloaded.

For the performance of these and the other tests, the state has laid out a testing field, with a cinder track, and on one side, the brick test building. In the building is located the 150-hp. dynamometer to which the tractor engine is connected by a belt for the brake-horsepower tests. Drawbar tests on the field are given by means of a tractor chassis upon which is mounted an electric generator, which replaces the engine and is driven by the chassis wheels. Chassis and tractor are connected by a traction dynamometer, which records drawbar pull, distance, and time elapsed. Much time and thought has been spent by experts of the state's experiment station on the design of this chassis and dynamometer, as fully half of the many tests are given on the field with this equipment.



PHOTOS BY COURTESY OF THE UNIVERSITY OF NEBRASKA

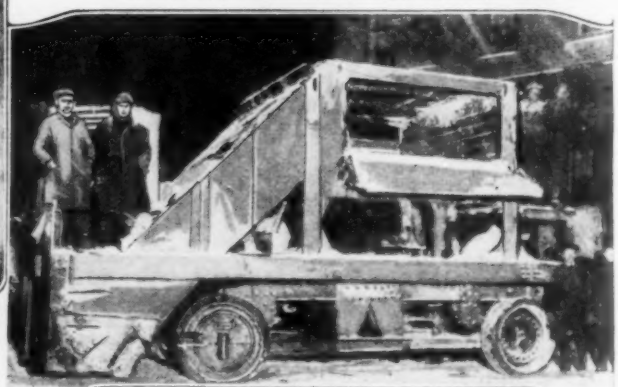
The Dynamometer, Shown with Its Switchboard and Other Instruments, is Used in Tests of the Tractor Engines Submitted for Examination

HURRICANE BRINGS PARALYZING SNOW BLOCKADES

Pictured on This Page Are Three of the Methods Employed for the Removal of Snowdrifts from the Streets of New York City after February's Disastrous Three-Day Blizzard. The Snow Melter at the Left, Carrying 1,800 Gallons of Crude Oil, Washed the Streets with Streams of Flame. Oil is Forced from the Nozzles in Front of the Shield by Compressed Air

Terrible in War, the Army Flame Throwers Sent from Edgewood Arsenal, Maryland, Made Not the Slightest Impression on the Snow. An Officer and Two Men of the Detail are Shown, Above, in Central Park at the Start of the Experiment

Here, below the Operator's Seat, are Seen the Two Conveyor Belts. Pushing into the Snowdrifts at Five to Ten Miles an Hour, the Machine Delivered 10 Cubic Yards Every 30 Seconds. A Single Engine Supplies Power for All Operations



This Machine Did the Work of Hundreds of Men. Picked Up by Conveyor Belts, the Snow Passes to a Bin, Whence It is Dumped into Auto Trucks, a Load at a Time

AND UNEXPECTED DISASTERS TO ATLANTIC COAST

Damage to Fishing Piers and Boat Houses Was General along the Atlantic Coast. A Surprise, However, Was the Partial Destruction, Il ustrated Above, of the New Sea Wall at Longport, a Suburb of Atlantic City

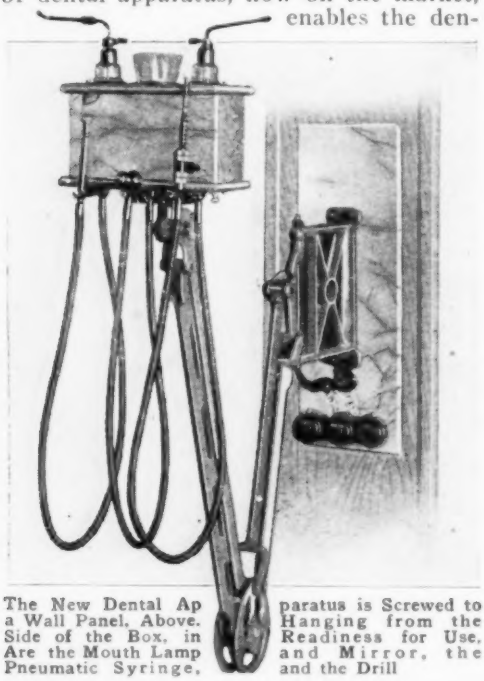
This Photograph, Taken a Few Days before the Tempest, Pictures a Completed Portion of the Wall. The Concave Front Is Noteworthy. The Total Cost was to have Been in the Neighborhood of $350,000

Though, in the Main, the Reinforced Concrete Withstood Successfully the Assaults of the Waves, Destruction of Some Sections Was Complete. The Section Pictured was Torn into Fragments Averaging 10 to 15 Feet in Length

PHOTOS BY ATLANTIC PHOTO SERVICE

TOOLS GROUPED CONVENIENTLY IN NEW DENTAL APPARATUS

Use of a new and rather elaborate piece of dental apparatus, now on the market, enables the dentist to work quickly and with a minimum of lost motion. The apparatus consists of a wall bracket, and a double-hinged arm that swings over the recumbent patient. At the arm's end is borne a small box in which are mounted heating coils and the drill motor, and from which hang the drill, the electric mouth lamp and mirror, and a hot or cold-air syringe. These instruments are controlled by switches and levers beneath the box. On top of the box rest a tumbler, and two atomizers, which may be connected to the compressed-air hose of the pneumatic syringe.



The New Dental Apparatus is Screwed to a Wall Panel, Above. Hanging from the Side of the Box, in Readiness for Use, Are the Mouth Lamp and Mirror, the Pneumatic Syringe, and the Drill

FRENCH RAILROADS IN AFRICA PLANNED ON LARGE SCALE

French plans for new railroad lines in Africa call for an expenditure of $800,000,000 in the next 15 years on 18,000 miles of track. Algerian and Moroccan lines will first be extended, followed by a line across the desert to Lake Chad and the Niger River. The system will be completed by lines between Marrakesh and Dakar on the west coast, from Abeshr to El Obeid, connecting with the Egyptian Sudan system, and from Zemio to Stanleyville, in the Belgian Congo, and to Port Florence, connecting with the Cape-to-Cairo lines. All these will be fed by various branch lines.

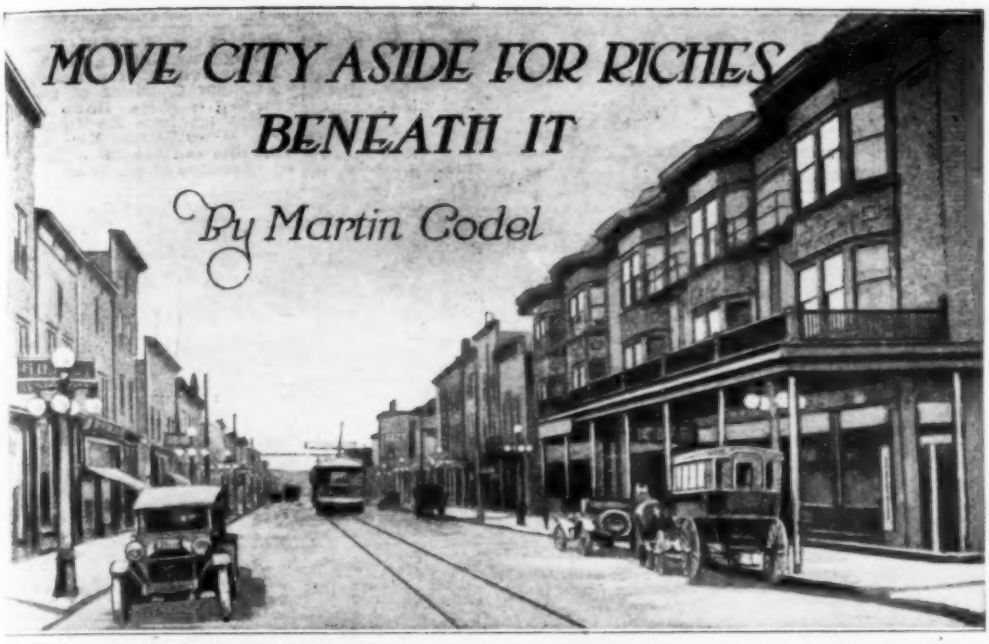
HINGES PERMIT FOLDING OF FAN BLADES

Winter storage of the big ceiling fans, commonly used for ventilation purposes, presents a problem that annoys annually the engineers of the larger hotels. The problem no longer bothers one of these men, however. He has had the long blades of each fan sawed through near the hub, then had the parts reunited by means of hinges of his own invention. Each hinge has a thumbscrew adjustment that permits the blade to extend in normal, horizontal position, to be tilted at a slight angle to the horizontal, or, finally, to be folded back vertically. With all the blades in this last position and with an ornamental bag drawn neatly over them, the fan is neither unsightly nor exposed to the dust in cold weather.

By Sawing through the Blades, Then Uniting the Parts with the Newly Invented Hinges, the Ceiling Fan is Made Quickly Adjustable to Any of the Positions Shown. The Normal Position is Seen at the Upper Left. At the Upper Right the Thumbscrews are Tightened for the Second Blade Position, Which Distributes the Air over a Larger Area. The Blades Have been Folded Back, at the Lower Left, and Covered for the Winter, at the Lower Right. The Hinges Are Kept during the Summer Dust-Proof Cover, or Bag, is in Vertical Shaft, as Seen in Small Box, Fixed to the

MOVE CITY ASIDE FOR RICHES BENEATH IT

By Martin Codel

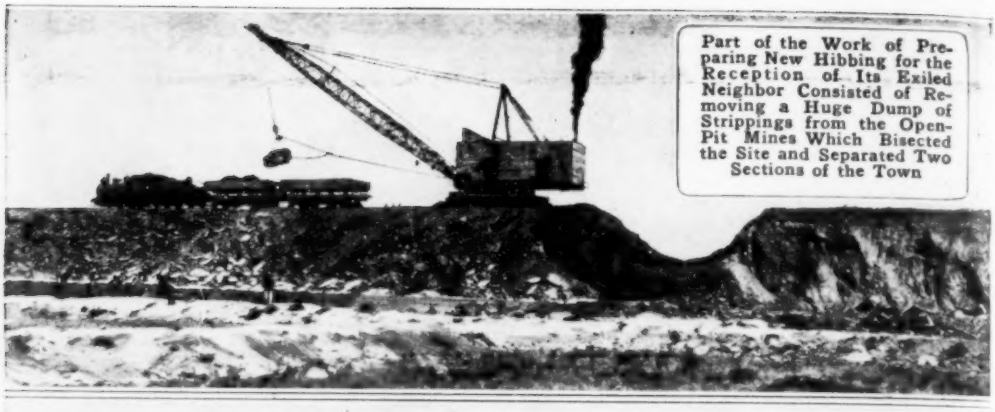


View on the Main Street of Hibbing, Minnesota, the Substantial Buildings of Which are to be Moved to a New Main Street in a New Hibbing, South of the Present Site, to Make Way for a Huge Open-Pit Iron Mine: The City's Present Site Overlies an Immensely Rich Ore Bed

IMMOBILITY, as the word is ordinarily understood, is only relative after all. Archimedes, in the exuberance of his discovery of the lever, offered to move the world if only a fulcrum were provided. When a city has reached the dignity of more than 10,000 population, with substantial brick buildings and a street-car line, and all the other customary appurtenances of municipal enterprise, it is a habit to regard it as a fixture, without putting any further thought on the matter. But even a solid city can be moved by the most powerful of all levers, the force of gold.

The city of Hibbing, Minn., stands directly upon one of the richest deposits of iron ore in the whole Mesaba region. On three sides of it, east, west and north, the huge open-pit mines of red hematite creep closer and closer, as their great 360-ton steam shovels, biting off 16 tons of ore at each sweep, nibble away at the earth. Now impatient industry will wait no longer for the good steel-mill food that lies under the main street, and under

General View of a Part of the New Hibbing, South of the Old City, Which is Constantly Growing Larger as the Structures of the Old Town are Moved Piecemeal to the New Locations Prepared for Them



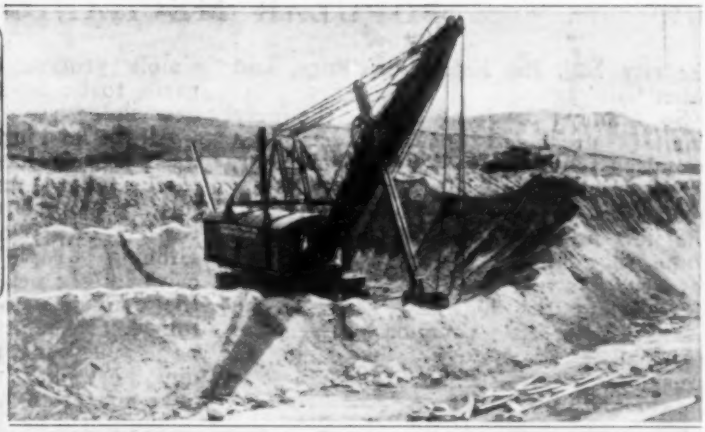
Part of the Work of Preparing New Hibbing for the Reception of Its Exiled Neighbor Consisted of Removing a Huge Dump of Strippings from the Open-Pit Mines Which Bisected the Site and Separated Two Sections of the Town

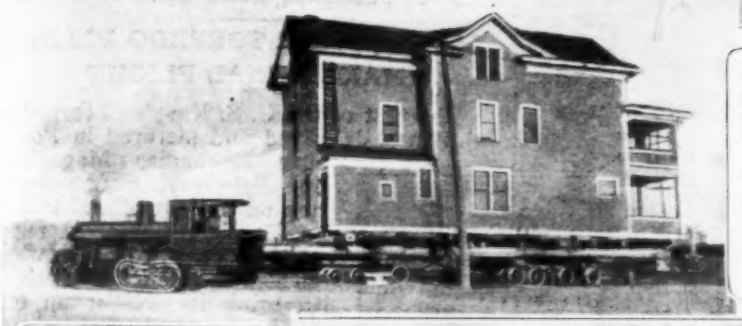
One of the Big Iron Mines That has been Creeping Up on the City, Which Now Fairly Stands on the Brink of the Pit: The Ore That Lies in the Direction of the City Is Particularly Rich in Iron

New Hibbing has been Getting Ready for Its Guest for Some Time, and has Already Provided This Big Electric-Power and Central-Heating Plant to Take Care of the Enlarged Community, at a Cost of Some $900,000

The Future Main Street of New Hibbing, for All Its Frontier Appearance, Begins to Show Signs of Establishment. Some Permanent Structures Are Already in Place, and Contracts have been Let for a Number of Office Buildings, Mine Headquarters, and Other Civic Features

One of the Enormous Steam Shovels That will be Used to Tear Away the Last Vestige of the City of Hibbing, to Get at the Ore Underneath. The Shovel Weighs 360 Tons. Its Dipper Has a Capacity of Eight Cubic Yards, and Takes Up 16 Tons of Ore at a Single Dip. It Cuts to a Depth of 40 Feet below Its Track, and Its Width of Action, without Changing Its Position, Is 165 Feet





The Movement of Houses and Other Buildings over the Highway from Hibbing to New Hibbing has Become Almost a Procession. The General Exodus is Scheduled for Next Summer, but the Forehanded Members of the Population are Getting Away before the Rush

Two-Story Structures Moving Steadily Southward Are No Novelty in the Hibbing District, and Not Much of a Burden for the Big Steam Tractors Used, Practically Road Locomotives with Endless-Chain Treads

The Pretty Little Park in the Center of Hibbing is Laid Out on a Rich Bed of Iron Ore, Which Lies Just under the Surface. Since the Park cannot be Moved, It is Doomed to Destruction When the Shovels Start Working

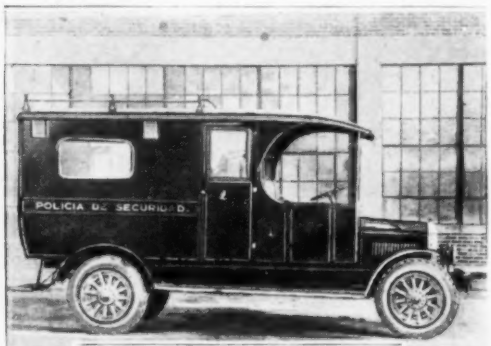
the city hall, the hotels, dwellings, and other buildings.

So Hibbing is going south, the only line of retreat left open. It has been promised sanctuary by its little neighbor, South Hibbing, and already many of its goods and chattels have been moved to the new home. House moving has become so familiar a sight that two and three-story structures advancing majestically along the highway between the towns arouse little comment. Even the city hall, a three-story brick edifice of considerable pretension, has undergone the calculating scrutiny of a Chicago contractor, who offered to transfer it by the simple process of cutting it in three parts, to be fitted together again on the new site.

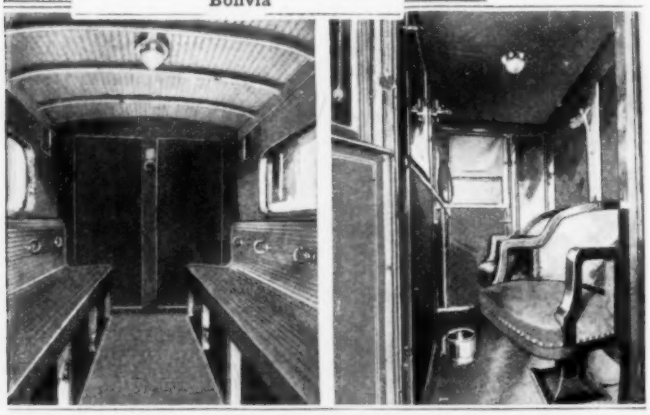
All the land in the main part of Hibbing itself already has passed into the hands of the miners, and they are eager to dig into its depths and tear away the last vestige of civic establishment. South Hibbing is rapidly being prepared to receive its big neighbor, and to give it all the conveniences to which it is accustomed. By next summer the hegira will be in full swing, and in a few years Hibbing, busy on its new location, will almost have forgotten to identify the great pit to the north as its former site.

NEW BOLIVIAN POLICE WAGON HAS OFFICE FOR CHIEF

An American motor-truck maker has been called upon to build, for a city in Bolivia, S. A., a police-patrol wagon of remarkable design. Just behind the driver's seat is a compartment, extending across the car, which is fitted up as a private office, with blue carpet and curtains, and swivel chairs upholstered in blue leather. This, of course, is for the chief of police. The compartment for prisoners, carefully separated from the chief's office, is peculiar for a series of metal rings fixed to the seat backs, to which the handcuffed captives may be chained. All parts of the car are electrically lighted. The driver's seat, also inclosed, makes a third compartment. The exterior is finished in the conventional dark blue, and is distinguished by a radiator of burnished aluminum.



Luxurious New Police-Patrol Auto Constructed for a City in Bolivia



In the Interior View, at the Left, the Rings for Chaining Prisoners may be Seen. At the Right Is the Compartment Reserved for the Chief

NAVY'S FIRST TORPEDO PLANE MAKES TRIAL FLIGHT

The first of the U. S. Navy's 10 torpedo airplanes, described and pictured in Popular Mechanics Magazine for February, a few days ago underwent official trials at Cleveland, Ohio. A regulation navy torpedo was filled with dummy explosive to bring its weight up to 2,087 lb., and was then strapped to the fuselage between the units of the double undercarriage. Loaded thus, and with the naval officials as passengers, the big plane exhibited a speed of 114 miles an hour, and climbed 4,000 ft. in six minutes. The naval inspectors had reason to be satisfied, as the specifications called for only 105 miles an hour, and a climb of 4,000 ft. in 10 minutes. Work is now proceeding at Cleveland on the nine additional planes called for by the navy contract.

FACTORY ESTABLISHES SCHOOL FOR FOREIGN EMPLOYES

The transformation of several hundred alien employes, many of them unable to read or write any language, into English-speaking American citizens, is the task recently undertaken by the management of a large eastern manufacturing plant. As the initial step toward this end the company has established a school, in which the foreigners are taught the language of this country, and urged to become naturalized. The institution is in charge of an industrial-service expert, who devotes all of his time to instructing and assisting foreign-born workers.

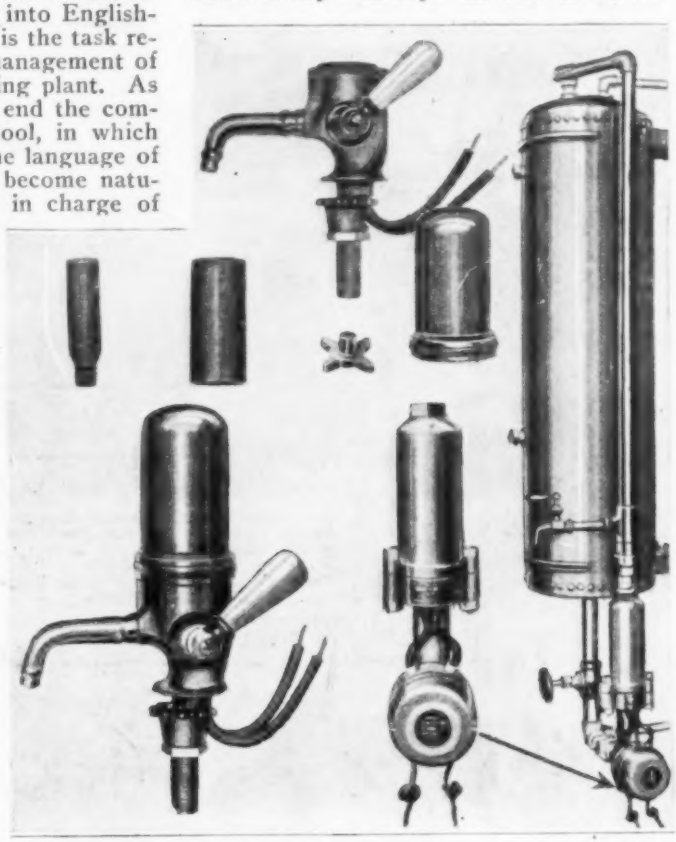
An interesting feature of the project is the novel method employed in teaching English. The tutor selects several simple words, and requests a class to repeat them after him. When the pupils are able to do this without his leadership, he defines the words by pantomime, and finally composes sentences containing the words. By this means, 50 men, previously without knowledge of the language, were taught to speak and understand five English sentences in 20 minutes.

Among 18,000 persons employed in the factory, there are 2,100 aliens, including 1,000 Italians and 600 Poles. The remaining 500 foreigners are of various nationalities.

TINY ELECTRIC UNIT HEATS HOUSEHOLD WATER SUPPLY

The water in a household supply tank may be automatically kept as hot as desired, or, by turning a switch, heated as it passes into the tank by attaching a small electrical unit just placed on the market. The water flows through an annular space between a tube and a cylinder of graphite which are connected to the regular house circuit and form the electrodes. The high-resistance heating element is the water itself, which incidentally is completely sterilized in the process. By means of a thermostatic switch, the current may be automatically turned off when the water is hot.

The device is also made for applying to individual faucets, which then have hot water always on tap. In this form, the graphite electrodes occupy a cylindrical casing just above the faucet, and the current is switched on by the act of turning on the water. So extremely rapid is the heating action that the water flows hot from the tap in any quantity desired, and current is consumed only during that interval. Cold water may be obtained as from an ordinary faucet merely by cutting off the current.



At the Left, Below, Is the Electric Faucet Water Heater, and Above, the Details of Its Graphite Cylinder and Tube, Valve and Switch, and Casing. At the Right Is the Tank-Heating Unit, and a Tank with One Installed

¶Telephone wires in the United States have reached the enormous total length of 22,827,188 miles, the new government census reveals. There are 11,716,520 telephones, connected through 53,234 organized systems or lines. The total number of messages in 1917 was 21,845,722,335, or 211 per capita.

AIRMAN'S FINAL FLIGHT MADE IN COFFIN STRAPPED TO PLANE

Mournfully appropriate were the obsequies of an American airman who recently died in army service at San Jose, Calif. In compliance with his dying wish, his fellows strapped his coffin to the fuselage top of an army plane. In this position it was borne to the cemetery, where the plane taxied to the very edge of the grave. Piloting the winged hearse on this last flight was an officer who had accompanied the dead man on many night-bombing raids on the western front.

Above, the Coffin is being Strapped to the Fuselage, as the Dead Airman's Friend Prepares to Take His Place in the Pilot's Cockpit. The Plane Carried the Coffin to the Very Edge of the Grave

The Airplane's Wing Tips Are Noticeable in This Scene at the Grave. The Plane Carried the Coffin to the Grave Side

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¶Horseshoes and attachments of various designs calculated to prevent slipping on icy pavements are being studied by an eastern society devoted to the welfare of the horse.

GOOD ROADS TO PROTECT CANAL AND DEVELOP PANAMA

The jungle trails of Panama are soon to make way for modern highways. The United States Army has already started work on a system that is to gridiron the Isthmus for 40 miles on either side of the canal. The army strategists once considered the jungle on east and west sufficient defense against an invading army, but the recent campaigns of the British and Germans in similar regions of East Africa have demonstrated the flimsiness of such a barrier. Consequently the army men are pushing the construction of roads over which the Zone's mobile garrison, with its supply trains, may be marched quickly to any landing place along the coast. Supplementing this purely military program is the building campaign shortly to be waged by the Republic of Panama, at present without a single modern road. In the interests of economic and political unity, the republic is to link, in this way, its isolated provinces, towns and villages. Central trunk highways of concrete will probably extend east and west with branches leading to the coast towns on north and south. According to estimate, such a system will total 350 miles in length.

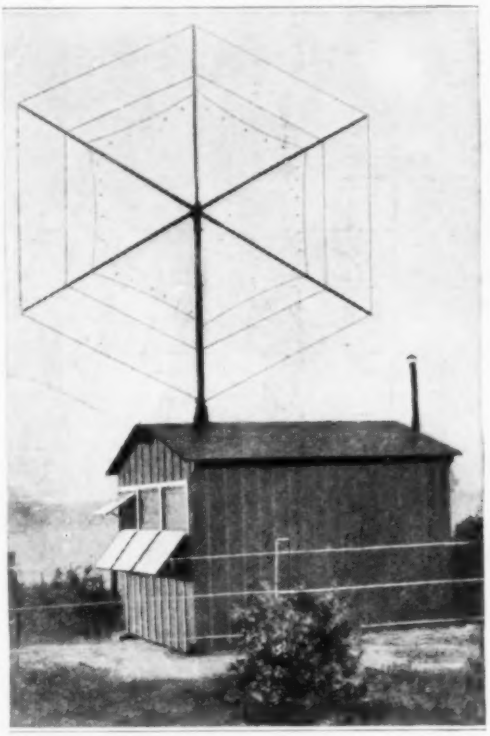
HIGHEST DAM TO CROSS GORGE IN NORTHERN INDIA

The highest dam in the world is planned for the Sutlej River in northern India. Here, some 40 miles above Rupar, and near the head of an existing canal, the wall will be thrown across a deep gorge, more than 1,000 ft. wide. The dam will be 395 ft. high, and as good foundation rock has been found near the surface, the water impounded during the August floods will be very nearly as deep.

TRACKING SUBMARINES BY RADIO

By SAMUEL W. BEACH

MUCH was accomplished during the great war toward perfecting the art of communicating through space without wires. The radio went still farther, turned sleuth-hound, pussyfooting with uncanny acuteness of perception over the grim, gray alleys of the seas in ceaseless search of submarines and other marauders of the enemy. It spoke not, it warned not, our ethereal ally; but with keen ears it ever listened. Whenever a prowling U-boat poked its whaleback to the surface to sputter forth a curt word to Berlin, it was coquetting with dire disaster, for upon the instant, our wireless detectives, perhaps hundreds of miles distant, heard, deftly calculated, and reported the exact spot upon the ocean whence came the sounds. Within a few minutes allied warships would be racing thither to comb the vicinity with deadly depth bombs. Even though the submarine succeeded in escaping, it could hope for no further sport close about, because certain of the great radio plants ashore had promptly broadcast warnings to all passing merchant steamers, which immediately turned in their tracks and scampered away to safety.



A Wireless Spy: The Picture Shows the Weblike Antenna, Which Made It Possible for the Radio-Goniometer Station to Assist in Locating German Submarines

Located at opportune points along the allied coasts were little inoffensive-looking shacks. Had it not been for a spiderish framework supporting a thin web of wires, which rotated weirdly like a weathercock upon a slender pole protruding from the slatted roofs, these buildings would have looked more at home in the barnyard. The mystifying shelters were radio-goniometer stations, the most pitiless of our spies. Some warships, also, were thus equipped, and in certain instances the antennæ were concealed within the buildings both ashore and afloat so that no prying alien eye might detect their presence.

The operation of a radio-goniometer of this type is very simple. It is based upon a phenomenon which occurs when the antenna is slowly rotated, the incoming signals being audible with greater or less intensity as the plane of the rotated framework presents its wires at varying angles to the direction from which the sounds emanate.

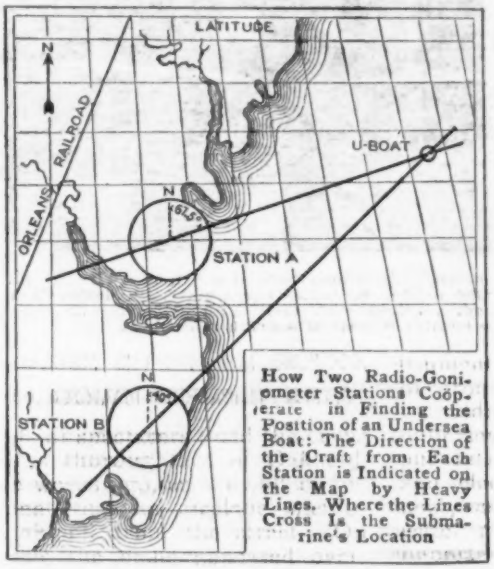
Within the building is an ordinary wireless receiving set supplied with particularly keen detectors. The antenna pole continues through the roof downward, passing through a circular, metallic plate permanently fixed at a convenient height for the operator. Around the circumference of this plate are marked the 360 degrees of the compass, with the zero mark due north. Attached to the antenna pole is an arrow-shaped pointer which, moving just above the fixed plate, indicates at all times the compass position of the overhead antenna.

When the operator hears a suspicious radio signal, he slowly turns the frame until the sounds are at their minimum. The degree marked upon the fixed plate and now pointed to by the arrow is noted, after which the frame is rotated about 180° and the minimum again noted. From this second reading is subtracted 180, and the average of the two numbers found. That average is the compass direction of the incoming sounds.

For example, "Station B" in the accompanying diagram, obtained 38° at its first reading, and 222 at the second. Deducting 180 from the latter and taking the mean of the remainder, 42, and the for-

mer reading of 38, the compass reading is found to be 40°. Unfortunately, the operator at B has no means of knowing whether the sound comes in from the east or west; but he does know that one end of a line drawn at a 40° slant through the center of his station points toward the culprit being sought. He ends responsibility by telegraphing the numerals "40," to a designated central station.

Stations of this type must work at least in pairs. While Station B is busy at it, Station A, some miles up the coast, is doing the same thing. Assuming that this latter office finds that the signals have dropped out entirely as the antenna revolves, a slightly more complex procedure is encountered. Rotating the antenna at a snail's pace a point is reached where sound ceases. That degree is noted. The frame is again moved slowly until the tiniest ripple of sound is again heard, and that degree is noted. The figures in this case were 45 and 89°, the mean of which is 67. The antenna is advanced around half the circle, and the zone of utter extinction is found to be between 225 and 271°, from the mean of which 180 is deducted, giving the second mean reading, 68. The average of the first and second readings is 67.5; and A's message to headquarters is a laconic "67.5."



How Two Radio-Goniometer Stations Cooperate in Finding the Position of an Undersea Boat: The Direction of the Craft from Each Station is Indicated on the Map by Heavy Lines. Where the Lines Cross Is the Submarine's Location

The central office, having received the reports from both A and B, turns to a chart, and draws thereon two lines. One of these lines passes through the center of Station A at an angle of 67.5° east from north, while the other passes through Station B at 40°; and right where those two lines cross each other is the spot where that foolish U-boat poked its whaleback to the surface to sputter a word to Berlin.

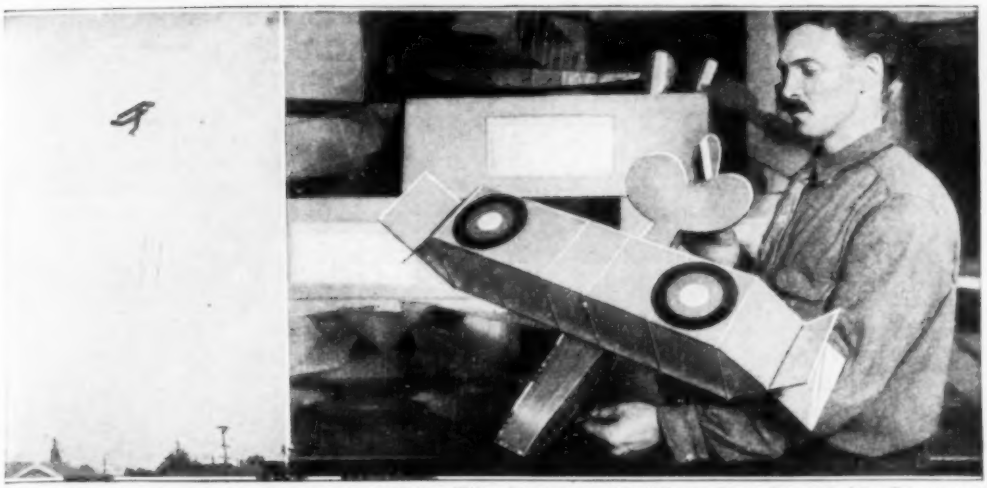
It sometimes happens that there is a zone of extinction containing the zero degree. The sound may come from almost due north, and be lost when the arrow points to 348; continue absent through zero, and reappear at 30°. That's easy, too. To rectify this, the sum of 360 is added to the 30, making the first reading 348 and the second 390. An average of these gives the impossible degree of 369, impossible because there are only 360° to the circumference of a circle. By deducting the 360 previously added, however, a balance of 9° is obtained, which is the compass average between the readings 348 and 30.

This explains with reasonable simplicity a type of radio apparatus that thoroughly deserves—cold, silent, obscure though it was—a hearing, when that much-mooted question as to who and what really won the late war is finally laid before the jury of the world. Nor did the goniometer confine its activities to enemies at sea. It quite often detected a choice morsel in the form of a Teuton spy station artfully concealed in a garret, but artlessly attempting to slip a spasm of sparks to Wilhelmstrasse. The Spaniard in the kaiser's pay, whose secret radio outfit was discovered near Saint Nazaire in the spring of 1918, owes his debt of hatred to the gonio that discovered him.

TOY GLIDER FLOWN LIKE KITE, THEN RELEASED IN MID-AIR

A toy biplane glider now manufactured is flown like a kite to a desired altitude, where it is released by a jerk on the string. It then glides, or spirals, to earth in accordance with the previous setting of the rudder. As taken from the packing carton, the toy consists of a rudder, a boatlike fuselage, and wings of wire and cloth construction. The three are easily fitted together; the controlling cord is attached to a patented hook which snaps into an eye beneath the fuselage, and the little airplane is ready for flight.

To get the toy into the air, an assistant holds it loosely, while the flier pays out about 50 yd. of cord. The flier, or operator, then runs into the wind, and the plane soars aloft. When it is high enough the operator pulls the cord free, thus



Gliding Unaided toward the Camera, One of the Kite Airplanes with Which Such Remarkable Results are Attained is Seen at the Left. The Fuselage, Rudder, and Wings have been Joined, at the Right, to Show How the Airplane Appears When Ready for Flight

starting the plane upon a long glide to earth. With experience comes ability to "stunt" the plane at will. If a loop is desired, for example, the operator sets the rudder straight, gets the plane up about 50 ft., then gives the cord a long, steady pull. This tilts the nose and stalls the plane. The releasing jerk then throws it over into the desired maneuver.

NEW METHOD OF COLOR STUDY MEASURES EXACT VALUES

An English scientist has worked out a method of taking exact measurements of color. Black, white, and gray are photometrically compared with standard white, and their composition expressed in percentage of black or white. A color, such as red, is compared with a white surface in a pure red light. If the red appears darker, it is matched with a gray surface under red light, the percentage of black then being the same in both. Lighter red is compared with gray under a complementary light of blue-green, and matching the two surfaces gives the percentage of white. Assigning the number 25 to red, such a composition as cinnabar would be signified by the figures 25 .04 18, meaning red with 4 per cent of white and 18 per cent of black. Yellow is called 00, ultramarine blue 50, and green 75.

¶ Parasitic fungi annually destroy 80 per cent of the sweet-potato crop in the United States, according to experts. Experiments are being conducted for the purpose of discovering a means of eradicating the pests.

ODD ELECTRIC TRUCK HANDLES SHELLS OF LARGE CALIBER

For carrying shells of large caliber about a munition factory, or arsenal, a manufacturer of industrial equipment is now producing an interesting storage-battery truck. To the front of the truck are fixed two uprights of channel steel. Over pulleys at their tops, steel cables run, from a powerful electric motor to a leather-lined clamp. When a shell is to be moved, the truck is run up to it; then the clamp is lowered, and locked about the shell. Started by the truck operator, the hoist motor slowly raises

The Truck Above has Picked Up a Great Shell and Is Ready to Carry It to Any Part of the Munition Plant. The Truck Proves Itself Particularly Valuable in Loading Freight Cars

the shell to a vertical position, its bottom several inches from the ground, then automatically stops. The uprights are tilted back to take the strain off the lifting gear, and the truck rolls with its load to warehouse or freight car.

NEW LEMON VARIETY GROWS LARGE AS GRAPEFRUIT

To the half a hundred known lemon varieties must now be added the so-called Ponderosa lemon, latest product of horti-

The Fruit of This Tree is Called, Appropriately, the Ponderosa Lemon. It Is About the Size of the Grapefruit, and may be Substituted in Every Process for the Ordinary Commercial Lemon

cultural wizardry. The fruit grows to about the size of the grapefruit, and is so heavy that the slender branches of the tree must be carefully supported by a trellis. In flavor, the Ponderosa lemon is rather mild, but it may be used in all ways like the ordinary commercial lemon. The tree may be cultivated indoors.

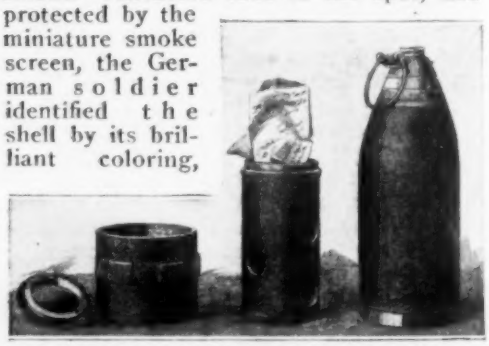
¶Assignment of an army officer to Paris, France, with the duty of helping visiting Americans to obtain historical and geographic information about the war, is contemplated by the War Department. The officer would be an assistant to the military attaché at that city.

EXPEND RECORD-BREAKING SUM FOR LINCOLN HIGHWAY

Reviewing the history of the Lincoln Highway during 1919 reveals some interesting facts and figures relating to the famous transcontinental road. Construction and maintenance cost an estimated total of $9,386,800, more than double the largest previous annual expenditure, $4,198,165, in 1916. Eleven states contributed $8,886,800 of this enormous sum, while the remainder was spent by various counties and cities. Over 377 miles were improved in different ways, leaving only 785 out of 3,323 miles, the total length of the highway, without improvement. Included in the new mileage are 121.14 miles of concrete roadway; 21.28 miles of brick pavement; 46.36 miles of bituminous and ordinary macadam, and 69.25 miles of gravel. According to statisticians, between 5,000 and 10,000 motor cars, carrying between 25,000 and 50,000 persons, used the highway last year for trips of 1,500 miles or more.

MESSAGE REPLACES EXPLOSIVE IN ODD GERMAN SHELL

A German message shell was recently brought to this country by a major general of the U. S. Army as one of his souvenirs of the World War. These shells, used only in the last months of the war, were fired from a German "77" near headquarters when all other liaisons with the front lines had been broken. The shell, on alighting in the supposed vicinity of German troops, announced its presence by emitting a dense cloud of smoke. Attracted thus to the spot, and protected by the miniature smoke screen, the German soldier identified the shell by its brilliant coloring,



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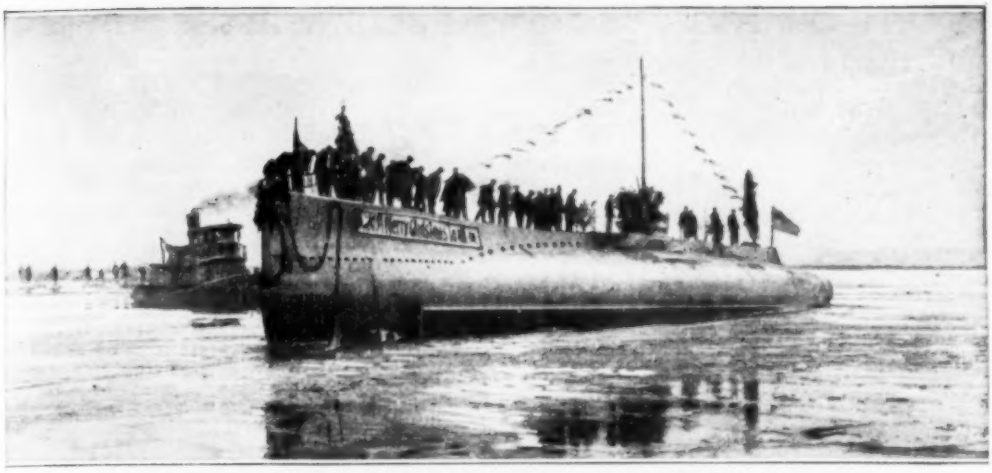
Disassembled and with a Message Protruding from the Container, is Seen a German Message Shell, Sometimes Used during the Last Months of the War

picked it up, removed the bottom, and pulled out the message container which replaces the ordinary explosive charge.



NEW SUBMARINE LAUNCHED FOR UNITED STATES NAVY

EARLY submarines were lacking in many respects. Not only were the craft undependable and dangerous, but they were deficient in cruising ability, when compared with other fighting ships. For these reasons, particularly the latter, many naval experts refused to give the underwater boat merited consideration. Today, however, the submersible is regarded in a different light, due to the fact that modern vessels of this type embody trustworthiness, safety, and efficiency in the highest degree. A notable example of what has been accomplished along these lines is the submarine "S-16," which was recently launched for the United States Navy at an eastern shipyard. The new vessel is equipped with every known device for protecting the lives of the crew, and has a cruising radius of 5,000 miles. Novel deck guns are included in the armament. Instead of being lowered into hatches when the craft submerges, these weapons remain in position, and are ready for instant use when the boat comes to the surface. The "S-16" is 231 ft. long, and has a submerged displacement of 1,500 tons.

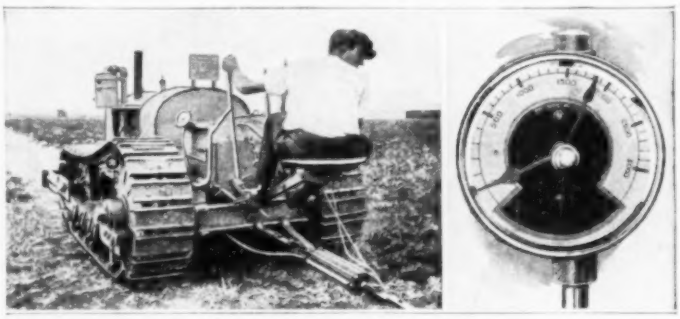
RAILLESS FREIGHT SERVICE PLANNED FOR SHANGHAI

A railless electric-car service is soon to link the important industrial areas and freight-handling centers of Shanghai, China, if present plans of the local street-railway company are carried through. The railless freight cars, or trucks, will take their power normally from the overhead trolley cables; but for travel up side streets, to warehouse doors, etc., current will be drawn from the storage batteries carried on each car. The installation of such a system will mean the end of the coolies' picturesque wheelbarrows and handcarts, which for centuries have carried the city's packages, large and small.

¶Hitting the bull's-eye of a target nine times in 36 shots, the battleship "Idaho" recently established a new record for the Pacific fleet. The "Mississippi" made the former high record, five bull's-eyes in the same number of shots.

DRAWBAR PULL IS MEASURED BY INSTRUMENT ON TRACTOR

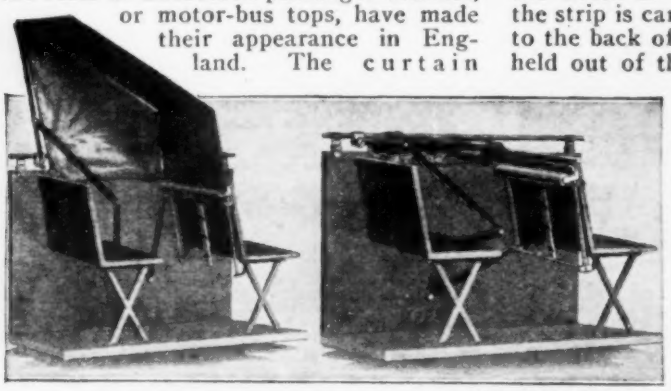
The drawbar pull of a tractor, which is its real measure of efficiency, may be read directly in pounds on a dial before the operator, with the aid of an instrument now available. The gauging member is virtually a spring scale, its coils made of special steel. A heavy flexible cable, protected by an armored conduit, transmits the movement of the spring to the dial, which may be located in any convenient position on the tractor, and gives a continuous record of the work done.



At the Left, a Tractor Equipped with the Drawbar Instrument: The Dial is Seen in Front of the Driver, While the Spring Is below Him. At the Right Is a Close-Up View of the Dial

SEATS ON BUS TOP HAVE FOLDING RAIN SHIELDS

Individual rain shields, or curtains, for the seats of uncovered passenger vehicles, or motor-bus tops, have made their appearance in England. The curtain proper is a strip of waterproof fabric just the width of the seat. In clear weather the strip is carried on a spring roller fixed to the back of the seat ahead, and is thus held out of the way. When the passenger desires protection, he pulls toward him an arm which lies along the vehicle's handrail. This action moves a rather complicated series of levers, which in turn unroll the curtain and hold it before and above the passenger. A side curtain is also provided, so sheltering the passenger in a little booth, which, though open on two sides, offers considerable protection against a driving rain.



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In Clear Weather the Rain Shield is Folded along the Handrail and Seat Back as Shown at the Right. When Its Protection is Desired, the Passenger Elevates the Curtains into Position by a Single Movement

PONDEROUS BRIDGE MOVED EIGHTEEN FEET

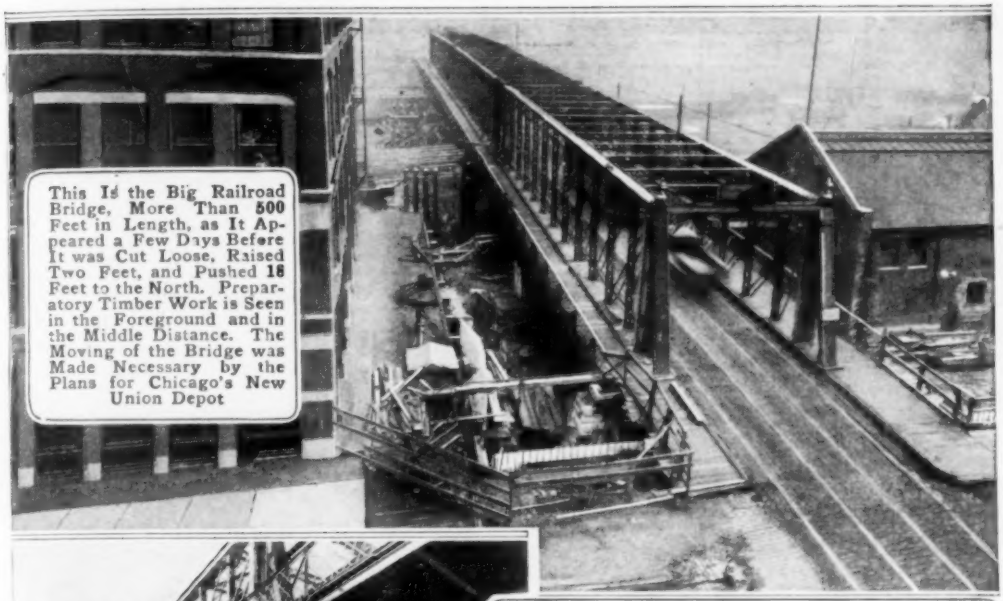
Preparations for the new Union Station in Chicago call for a tremendous amount of work. One of the most important operations has been the moving of the Harrison Street viaduct. This ponderous structure, more than 500 ft. in length, with its three 146-ft. truss spans, and its plate-girder span, 78 ft. long, had to be moved bodily 18 ft. to the north and raised two feet.

Weeks of preliminary work were required before the real operation could be performed. For one thing it was necessary to construct very substantial bents on which the bridge was to rest in its new position. These bents were made of 12 by 12-in. timbers, solidly framed and bolted together. Four crosspieces were placed on top of these, supporting in turn a layer of 12-in. timbers. In some instances cribbing was built to furnish additional support for the bridge, the cribbing being supported by 14-in. I-beams. In addition, many precautions were taken to insure rigidity while the bridge was being moved. It was thoroughly braced by the use of 24-in. steel I-beams extending from one span to another. Above these I-beams were angle plates, to bear the load that might be imposed when the bridge was moved. Furthermore, stout timbers were used for posts wherever additional strength and rigidity were required. Between the bracings heavy timbers were placed crosswise to counteract the thrust of the jacks in action.

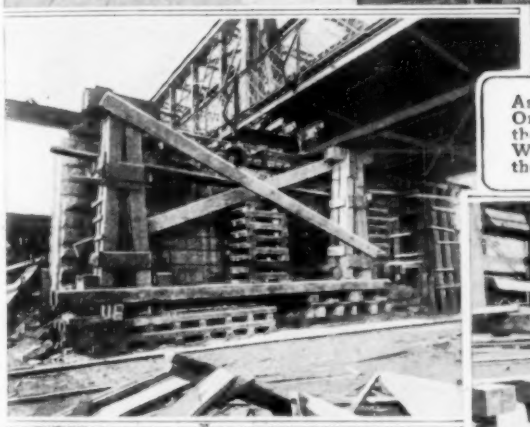
After all the fastenings of the bridge had been loosened, the bridge was jacked up 2 ft. so as to bring it to the level of the new location and in line with the bents. Then old rails were placed under each end to serve as skids. On top of these rails were placed smooth hardwood timbers, bolted together, and between the rails and the timbers 2-in. solid-steel rollers on which the bridge was moved.

Unusually large jacks were then set and braced. When the workmen were all at their assigned places and everything was in readiness, the command was given, the men applied the screws, and the bridge slowly began its movement northward. Within less than 12 hours the bridge had reached its new position, being none the worse apparently for its trip. Here it will remain in daily service until the south half of a new viaduct has been completed, whereupon it will be torn down to make room for the north half.

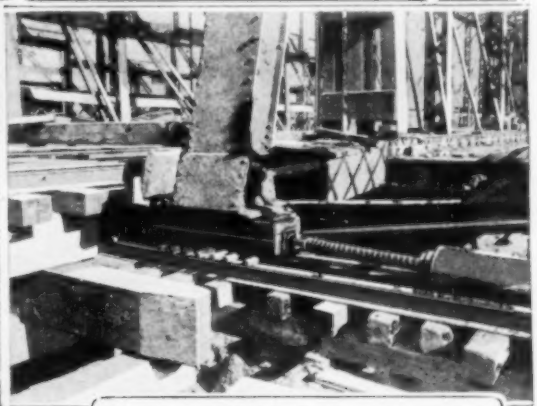
While preparations were being made for moving the bridge, work was in progress on the caissons for the new bridge. These were sunk 60 ft. below city datum, with the exception of one which was sunk down to rock. These caissons are 4 ft. 6 in. in diameter, the concrete extending to 12 or 14 ft. below city datum. Girders, 10 ft. deep, 5 ft. 6 in. wide, and 48 ft. long, were each reinforced with 8 tons of steel, and placed over the caissons. They will support the columns on which the new viaduct will rest.

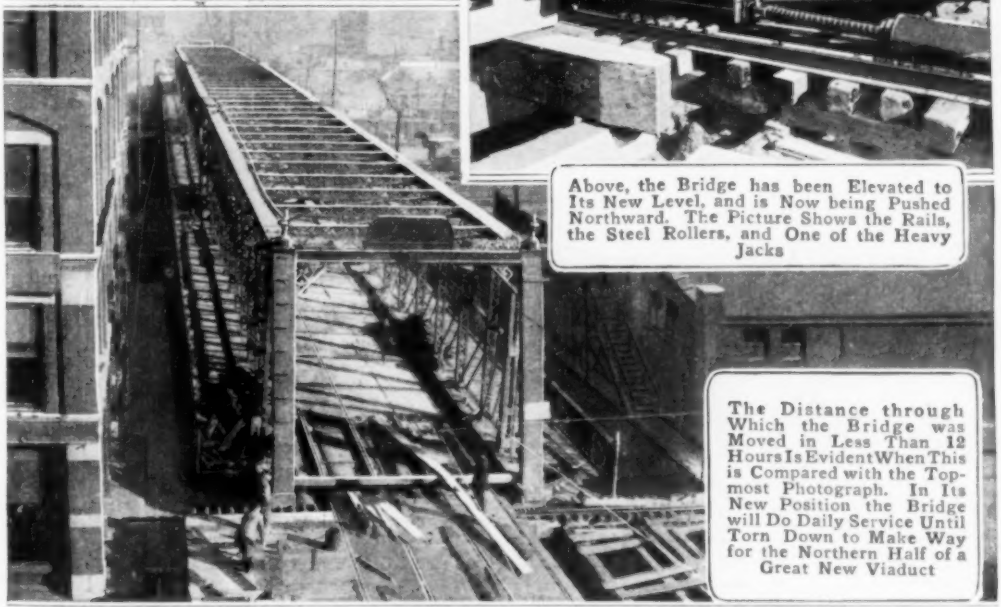


This Is the Big Railroad Bridge, More Than 500 Feet in Length, as It Appeared a Few Days Before It was Cut Loose, Raised Two Feet, and Pushed 18 Feet to the North. Preparatory Timber Work is Seen in the Foreground and in the Middle Distance. The Moving of the Bridge was Made Necessary by the Plans for Chicago's New Union Depot



As the Bridge is to Serve in Its New Position for Only a Few Months, Massive Timber Frames, like the One at the Left, were Built to Receive Its Weight. This Photograph was Snapped Just before the Movement North, or to the Left, as Seen Here





Above, the Bridge has been Elevated to Its New Level, and is Now being Pushed Northward. The Picture Shows the Rails, the Steel Rollers, and One of the Heavy Jacks

The Distance through Which the Bridge was Moved in Less Than 12 Hours Is Evident When This is Compared with the Topmost Photograph. In Its New Position the Bridge will Do Daily Service Until Torn Down to Make Way for the Northern Half of a Great New Viaduct

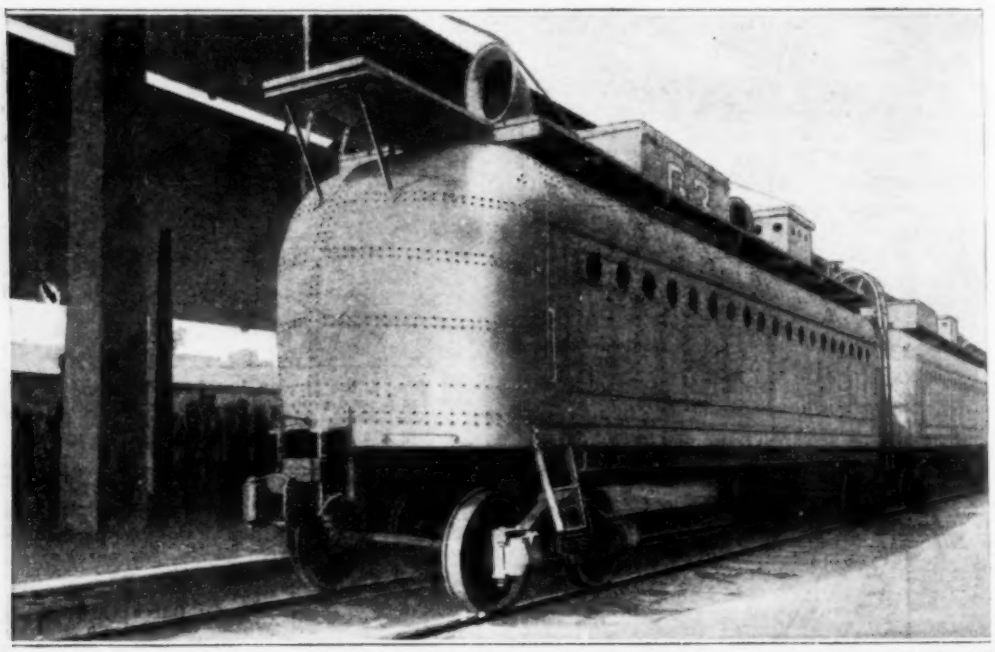
NOVEL DESK-TELEPHONE SET HAS DOUBLE RECEIVER

A desk-telephone set of peculiar form has been designed by a member of the staff of an Illinois hotel, and a number of advantages are being claimed for it. The transmitter and two receivers, one for each ear, are fastened together by a light frame, and for use are lifted out of their stand, which resembles a candlestick. The double receiver excludes outside sounds, and the user is compelled to keep the transmitter at the proper distance from his lips, assuring clearer transmission.

A Two-Receiver Telephone, Designed by a Hotel Operator: The Method of Using It is Seen at the Left, with a Close-Up View at the Right

U. S. SCHOOL PLAN TO GUIDE COLOMBIAN EDUCATORS

The public-school system of the United States is to be the model for the reorganized system of Colombia, South America, according to a statement from the minister of finance, recently on tour throughout our eastern states. School buildings of the American type are to be erected in all the cities of Colombia, in accordance with the educational program under his charge. Teachers for these schools will be trained in two large institutes at Bogota, the capital. The statesman anticipates, too, the founding of 50 scholarships which will enable graduate teachers to travel in the United States and Europe.



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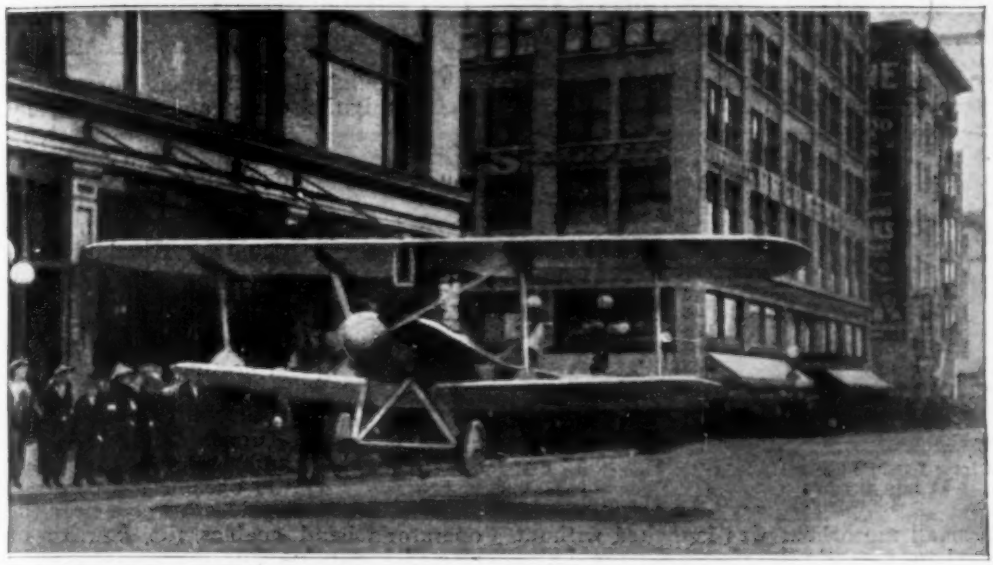
PROVIDE REGULAR ARMORED TRAIN TO FOIL MEXICAN BANDITS

IF any impression exists that Mexican banditry is an opéra-bouffe affair, conducted only to annoy the authorities at Washington, it will be dispelled by a glance at the armored train recently turned over to the main railroad system of Mexico by an American manufacturer, for use in the bandit-infested regions. The heavy boiler-plate cars are lighted by small round portholes up near the roof, and entrance is effected by ladder through a hatchway in the top. The steel ends are rounded in such a way that the whole body resembles the inverted hull of a ship, and the nautical suggestion is still further emphasized by a pair of ship's ventilators on the roof. It may well be imagined that the small arms used in guerilla warfare would be wholly ineffectual against these substantial rolling fortresses.



A Few Seconds After This Photograph was Snapped, the Airplane Skidded on the Slippery Pavement and Headed for the Crowded Curb. Luckily, It Came to a Stop before Doing Any Serious Damage. It was Decided, However, That the Exhibition Held More Peril for the Spectators Than for the Airman, So the Scheduled Take-Off from the Street was Forbidden

CROWDS LINE CURBS AS PLANE LANDS ON DOWN-TOWN STREET

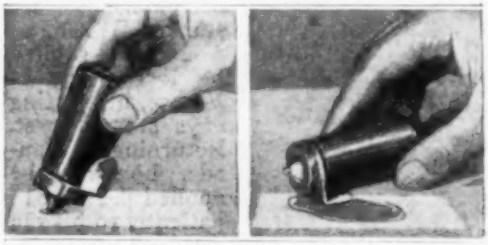
Thousands of spectators lined the curbs of a business thoroughfare in Oakland, Calif., some weeks ago, as a result of the announcement that an airplane was to land and take off from the street. On schedule time the plane appeared overhead, glided down between the walls of the man-made cañon, and touched the pavement. Skidding, here, on the slippery asphalt, the plane grazed a lamppost, swerved to the curb, and damaged its tail skid. The accident was trivial, but served as a warning to the authorities, who promptly forbade the take-off.

IMPORTANT SERVICE RENDERED BY CONSTRUCTION TROOPS

Behind the western-front firing line during the World War a highly efficient organization, the Construction and Forestry Division of the United States Army, unostentatiously performed service that made it possible for combatant troops to achieve victory. Among the division's especially noteworthy accomplishments were the construction of 15,039 barracks, which would extend 285 miles, if placed end to end; the completion of about 947 miles of railroad track; the erection of storage houses with a combined floor space of 21,972,000 sq. ft., and the establishment of a mechanical bakery, capable of producing 500,000 lb. of bread daily. In addition to these, the organization built several completely equipped docks; put into operation several refrigeration and electric-power plants, and installed many miles of transmission lines and water pipes, besides doing other highly important work.

CONVENIENT MUCILAGE BOTTLE HAS PUSH VALVE IN TOP

Applying mucilage becomes quite a dainty operation when the newest form of container is used. In the center of the top is a tiny ball valve. When, after inverting the bottle, this is pressed upon the work, just the desired amount of "stickum" oozes forth. A spreader on the side aids in distributing it.



A Convenient Mucilage Bottle: The Ball Valve in the Top is Pressed on the Work, as at the Left, and Then the Spreader is Used as at the Right

LOWER MOTORBOAT INTO LAKE FROM HIGH PRECIPICE

Lowered from the brink of a nearly perpendicular cliff, 1,500 ft. in height, a small motorboat was launched without mishap recently in placid Crater Lake, a body of water located far above sea level in Crater Lake National Park, southern Oregon. Four men performed the difficult task. During the long descent, the boat was lashed, upside down, to a heavy timber sled, which was let down the precipice with ropes. The craft was transported overland to the scene from Klamath Falls, a town about 30 miles away.

Crater Lake's First Motorboat: To Launch the Craft, Four Men Lowered It into the Water from the Edge of a 1,500-Foot Precipice. Strangely, No Damage was Done during the Descent

ONE-LEGGED VETERAN BECOMES EXPERT ICE SKATER

The unconquerable spirit of the crippled veteran has seldom manifested itself so strikingly as in the case of a mechanical draftsman of Toronto, Can., who before the war was an accomplished ice skater. When, as a British soldier, he lost a leg in France, his skating days seemed past. Returning to Canada, however, he applied himself patiently to his old art, and eventually learned to skate once more. Now he has become so skillful with his one skate that public exhibitions take up much of his spare time. His performance always elicits wondering applause.

CHEMICAL FIRE EXTINGUISHER PROTECTS MOVIE FILMS

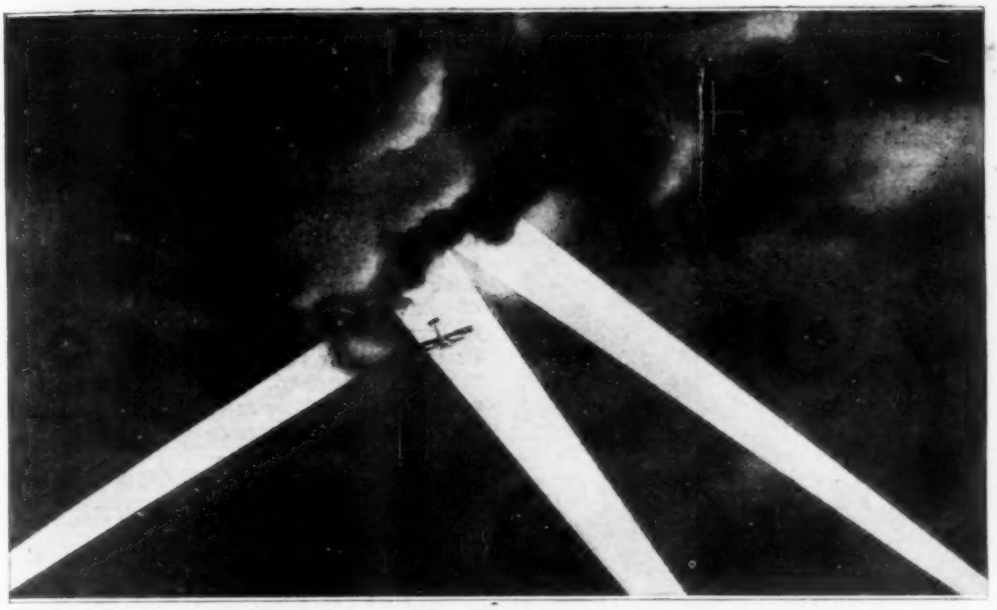
The celluloid films used for motion pictures ignite easily and burn rapidly, necessitating the installation of special protective equipment. A European inventor has combined a new chemical with an ingenious method of applying it, which saves, it is asserted, all of the film except the portion first ignited. The film in the projecting machine is surrounded by a ring of tubing with inner perforations, connected with an iron tank containing the chemical, a colorless liquid. A valve near the operator's hand enables the flow to be started instantly.

WEIGHT RAISED BY WINDMILL OPERATES DYNAMO

Irregular winds do not affect the production of electrical energy by a decidedly novel windmill, now in operation near Stockholm, Sweden, according to the inventor. Instead of being directly connected to the dynamo in the usual manner, the mill-wheel shaft is geared to a hoisting device, which serves to elevate a two-ton weight to the top of a 53-ft. steel-and-wood tower. When the weight reaches the maximum height, it is released, and, as it falls, actuates the dynamo, which is mounted on a bracket at the apex of the tower with the mill wheel. A storage battery and switchboard are housed in the lower portion of the tower. When the battery is fully charged, the mill stops automatically.

AMERICAN FACTORY PRODUCES FINE PLATINUM WIRE

Invading a field monopolized in prewar times by German manufacturers, an American company is now producing the extremely fine platinum wire used as cross lines in telescopes, and for other purposes. The material is prepared by imbedding a platinum core in a silver wire, and drawing the latter to a small size. By this treatment, the core is reduced to .00006 in. in diameter. The silver is later removed with acid, exposing the slender platinum filament.



REMARKABLE NIGHT PHOTOGRAPH COMES TO LIGHT

MEMORIES of sleepless nights in the crowded bombproofs of Paris will come to many at sight of this photograph, showing a German raider over the French capital. Exposed by a lieutenant in the U. S. Air Service, and brought by him to this country, the plate is reproduced here as one of the most remarkable night photographs taken during the war. The subject is a thrilling one. Feeling their way across the tumbling cloud patches, the rays from the giant searchlights have at last seized upon a Hun bomber, and now hold him fast for the attention of the anti-aircraft batteries. Though its fate is not a matter of record, the invader probably sought the protection of the clouds, and escaped.

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ICE ON LAKE CHAMPLAIN CATCHES FALLING RAILWAY COACH

ONLY the heavy ice saved the passengers in one of the sleeping cars when a section of the New York-Montreal Express tumbled down the embankment while crossing a small bay on upper Lake Champlain. Though a score were hurt, the ice prevented the complete submergence of the car, and later permitted the rescue of the trapped passengers. Pulled out of the car's flooded interior, the half-clad travelers were met and almost frozen by a temperature considerably lower than —30° F. The wrecking crane seen on the bridge is setting a second car back upon the rails.

PAIR OF LACE STOCKINGS WORTH SMALL FORTUNE

The man who makes it his boast that he never spends more than 50 cents for his socks will be interested in a pair of

A Serviceable Automobile could be Bought with the Price of These Lace Stockings, Recently Shown at a French Exhibition

lace stockings which were shown at a recent exhibition in Strassbourg, France. They are priced at $350. Reason for the high valuation is apparent when it is explained that the inserts, clearly seen in the illustration, are of rare Chantilly lace, and were almost eight months in the making. Though the flowerlike design seems a thing of fragile beauty, it is said that the material resists ordinary wear surprisingly well.

¶ Putting oil paintings under the X-ray forces them to reveal any counterfeit additions that may have been made to the work of the original artist, according to a Dutch scientist. It is also declared possible by this means to bring out the erased writings on ancient palimpsest manuscripts.

MOTOR-CONTROLLED RECEIVER TAKES ALL WAVE LENGTHS

Wireless receivers are now made which automatically search up and down a long range of different wave lengths, seeking either a definite call or a vacant region that can be used for transmitting a message. Switches, geared together and driven by a motor, gradually change the inductance and capacity of the receiving circuit in such a manner that messages in all of the 48 wave lengths between 300 and 3,000 meters are successively heard. When the desired call or vacant length is found the motor is stopped. The method makes available the whole range of wave lengths, and reduces interference to a minimum.

DEDICATION OF PANAMA CANAL PLANNED FOR THIS YEAR

Almost six years have elapsed since the first vessel passed through the Panama Canal, but the great waterway has never been formally dedicated. Plans for such a ceremony are being made, however, and the event is expected to take place some time this year, according to a recent announcement. While details are not available, it has been revealed that the affair will be international in character, and that a naval parade, comprising warships of all the powers, will be a spectacular feature.

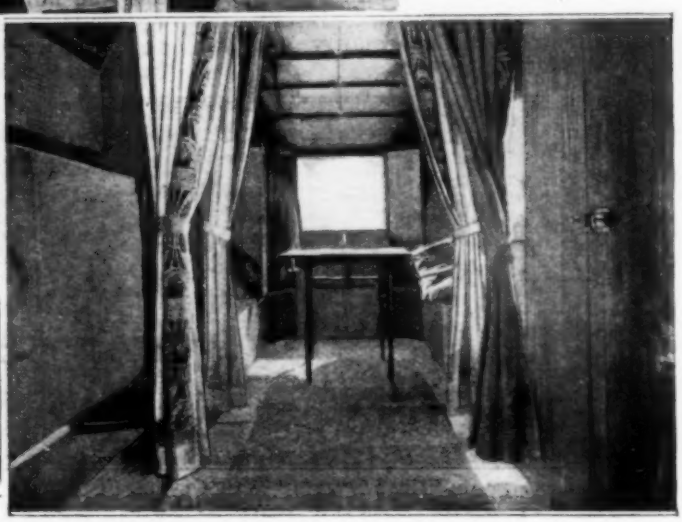
BIG HOME ON WHEELS BUILT OF AIR-CRAFT MATERIALS

Drawing on his knowledge of air-craft construction, a famous American airplane manufacturer has designed and had constructed for his personal use a motor trailer that resembles a private yacht in the completeness of its appointments, yet is so light, thanks to the use of wood veneer and other air-craft materials, that it is easily pulled along country roads at high speed by an ordinary automobile. The big trailer is about 20 ft. long, is supported by two wheels in rear, and in front rests upon a fifth wheel in rear of the touring car. Windows are provided at front and rear, and doors at either side. When a halt is made for the night, the sides are swung out, screens are put in place, and berths for six are let down as in a Pullman car. Meals are cooked in a locker on the port side, where are found all necessary kitchen utensils; they are served on a table set between the berths.

By Economizing Space as Carefully as in His Large Airplanes, the Manufacturer has Produced a Camping Trailer with Furnishings of Remarkable Completeness. Above, a Stop has been Made for the Night; the Sides Raised, Screens Inserted, and the Berths Swung into Place. The Cot at the Left Is for the Chauffeur

The Front End of the Trailer Rests, En Route, upon the Fifth Wheel of the Automobile, as Shown at the Left. Traveling in This Way, the Owner and His Friends have Already Proved the Sturdiness of the Airplane-Built Trailer by Trips, Totaling Many Hundred Miles, into the Mountains of New York State and New England

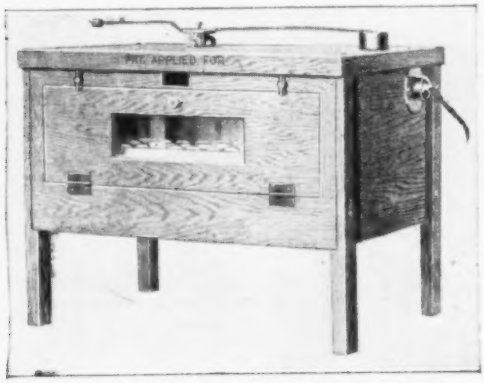
Looking Forward from the Rear, at the Left, the Trailer is Seen to be Divided by the Curtained Entrance Vestibule into Two Rooms. The Wide Beds in the Foreground will Accommodate Two Each, Those in the Forward Room, One Apiece. The Interior of the Itinerant Bungalow is Seen to Be Unbelievably Spacious



During Inclement Weather Meals are Served in the Rearward Room, on the Table Seen at the Right. A Locker, Not Seen in the Photograph, Contains the Oil Stove and a Complete Cooking Outfit. Food is Kept in an Icebox, and in a Miniature Pantry. Roomy Lockers Hold Bedding, Clothes, and Tools

ELECTRIC LIGHTING CURRENT HEATS NEW INCUBATOR

The farmer's increased use of electricity, often supplied by his own little generating plant, has resulted in the production of an incubator that is heated by electricity. In structure, the electric incubator resembles the familiar boxlike, oil-heated type; the heater, however, is replaced by an ordinary lamp socket. Current entering the incubator here, passes through resistance elements in the top of the box; these are arranged to distribute the heat evenly over the 75 eggs below. Double insulating walls prevent the escape of heat, while a thermostat keeps temperature constant. Ventilation is likewise automatic.



Resistance Elements in the Top of This New Electric Incubator Supply Heat to the 75 Eggs Below. Temperature and Ventilation are Regulated Automatically

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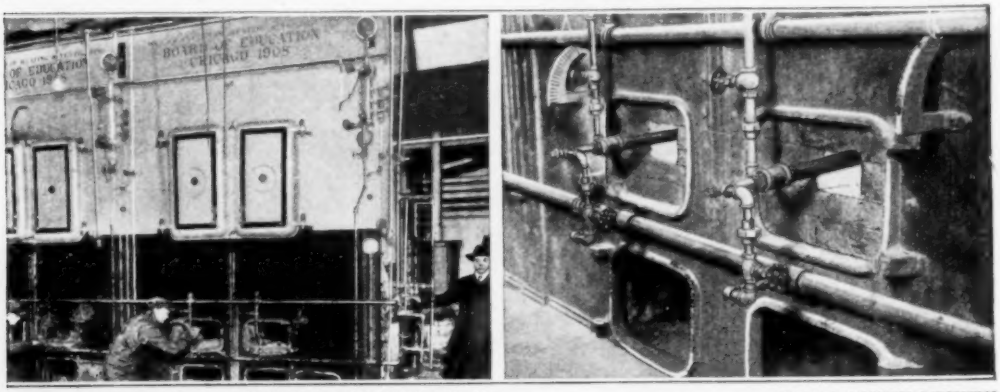
¶A machine for electrocuting insects in packages of cereals has been installed in a large factory in this country, and has given satisfactory results.

LOW EXHAUST PRESSURE MAKES AIRPLANE ENGINE SILENT

Reduction of the pressure of exhaust gases to as low as ½ lb. to the square inch is the result reported to have been achieved in a new airplane engine designed by two British naval officers. With the noise of the exhaust thus eliminated, the engine operates silently, and no flame remains in the discharged gases to cause fire risk. It is asserted that heavy fuels, such as crude oil, may be used, and that there is no diminution of power at altitudes of 20,000 ft. The same principle is to be applied to the construction of powerful gasoline engines for a new type of railroad locomotive now being built in England.

OIL BURNERS MAKE GOOD IN CHICAGO SCHOOLS

The fuel-oil equipment installed in many of the public-school buildings of Chicago during the recent coal shortage has proved so satisfactory that it will be retained, the use of coal being discontinued in these cases. The Board of Education has found that these buildings are easily kept clean because of the absence of dust and soot. Labor bills are cut, as there are no ashes to haul away, and as one engineer can attend to two or three boilers, replacing the three or four men formerly employed. The first cost of the oil-burning equipment was low, also, as the old fireboxes were used with but little change. The doors were simply removed, and the burners set in place. Then the openings were bricked up, leaving small ports for observation. The oil tanks are kept at a safe distance from the buildings.



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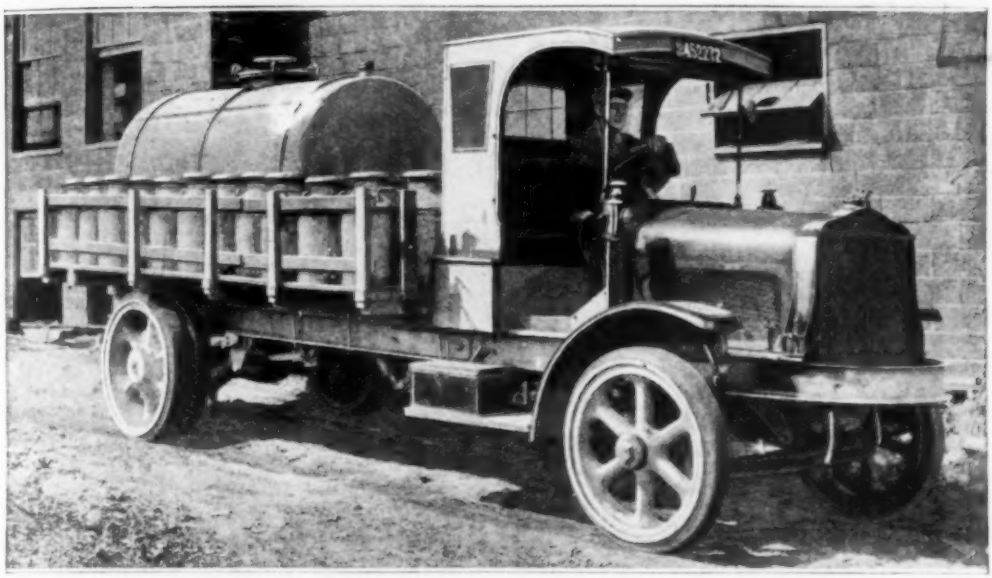
Oil-Burning Equipment Installed in Many of Chicago's Public-School Buildings during the Recent Coal Shortage: The Simple Conversion of the Coal-Burning Boilers to the Use of the New Fuel is Illustrated Above. The Fire Doors are being Bricked Up at the Left; at the Right Is a Detailed View



A Huge Glass-Lined Steel Tank, Built like a Vacuum Bottle and Mounted on a Powerful Truck, is Used by an Eastern Dairy Company for Transporting Milk from a Collection Station to an Evaporating and Canning Plant

TRUCK CARRIES MILK IN TANK BUILT LIKE VACUUM BOTTLE

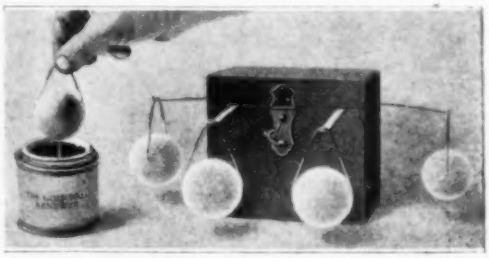
During its journey from rural producer to city consumer, or to a condensing plant, milk must be kept at a low temperature, in order to insure its freshness on delivery. To accomplish this result, a large eastern dairy company employs a 900-gal. glass-lined steel tank, in construction similar to a vacuum bottle, mounted on a five-ton motor-truck chassis. Around the tank is a rack for holding milk cans. With this unusual conveyance, milk is hauled from a collection station to an evaporating and canning factory, 10 miles distant. Two, and sometimes three, round trips are made daily. The contents of the can remain cool, even in the hottest weather.

AUTOMATIC SOUND REGISTER MEASURES OCEAN DEPTH

Sounding the depth of water is a phrase now doubly significant, since sound waves actually are used in the process. The method of measuring the time between an underwater explosion and its echo from the bottom, as described in this magazine last November, has been improved by a Swedish engineer, who makes its operation automatic. A sudden sound of definite pitch is produced by the apparatus, and simultaneously registered. When the echo sound is returned, that also is registered, and the time interval gives the exact depth. Other sounds do not affect it.

GOLF-BALL PAINTING OUTFIT INCLUDES HANDY DEVICES

An outfit supplied for use with a new quick-drying golf-ball paint makes the recoating of the spheres an easily accomplished task. Several wire clips, designed to serve as handles when the balls are dipped into the preparation, are included in the equipment, which is packed in a wooden box. During the drying process, these clips are employed to hang the balls on metal strips, which act as supports when inserted in a horizontal position between the box lid and the box itself. Less than an hour is required for the paint to dry thoroughly, according to the manufacturers.



Recoating Golf Balls: Held by Wire Clips, the Spheres are Dipped into a Can of Paint, and Then Hung on Metal Strips to Dry

AIR-CRAFT FACTORY ADOPTS X-RAY INSPECTION

The experimental use of the X-ray for the inspection of air-craft materials was described in Popular Mechanics Magazine for August, 1919. Now it is learned that those experiments proved so successful that the service has become an essential part of production routine in one great air-craft center, with factories near London, England. With his eyes to the fluoroscope, the X-ray inspector gives each vital part direct visual examination. Most of his time he spends in passing upon laminated wooden structures such as propellers and struts. Certain soldering and repair jobs must also get his approval.

This Inspector with His X-Ray Equipment, Examines Every Vital Part Used in the Construction of Airplanes at One of Britain's La gest Plants. He is Seen Searching for Possible Flaws in a Laminated Wooden Strut

ELECTRIC METER FOR PATRONS OF CENTRAL STEAM HEAT

Central steam heat is generally sold at a flat rate, because of the difficulty of metering the amount used. A system lately adopted in Denmark, however, is reported to be quite satisfactory, showing error of less than five per cent. Two thermoelectric couples are installed on the cusfomer's radiator, and a third on his wall. The feeble current set up by the temperature difference between these points is registered, and corresponds to the amount of heat used.

FIFTH AVENUE SOON MAY BE A "ONE-WAY" STREET

A city ordinance making Fifth Avenue a "one-way s. et" is declared by the Police Department of New York City to be the only solution of the traffic problem which has lately grown so perplexing. Whether the one-way regulation will prevail throughout the entire day has not yet been decided; it is probable, rather, that the ordinance will give the morning and early afternoon to south-bound traffic, then reverse the flow to accommodate the home-goers from matinées and offices. Traffic will be allowed to move in both directions, p r o b a b l y, after 7:30 p. m. A result expected from the anticipated ordinance is an actual increase in the avenue's capacity. While only six lines of vehicles can move at present, it is believed that one, and possibly two, will be added when all the traffic moves in the same direction. The experiment will be observed with interest by other cities.

FISHERMEN WANT SEAPLANES TO BOMB PORPOISES

Fresh opportunity to acquire proficiency in bombing submarines, this time of a living variety, may be afforded a number of French airmen. The sardine fishermen of the coast of Brittany are being harassed by great schools of piratical porpoises, whose attacks have so reduced the ranks of the small market fish as to threaten the industry. The ministry of marine has been petitioned to assign seaplanes to the fishing ports, armed with bombs of 300-yd. destructive area, for the purpose of exterminating the trespassers.

¶The portraits on paper currency printed by the Treasury Department in the future will be distinctive for each denomination, in order to make more difficult the alteration or counterfeiting of the certificates. For example, all two-dollar bills will bear a picture of Jefferson, and all five-dollar bills one of Lincoln.

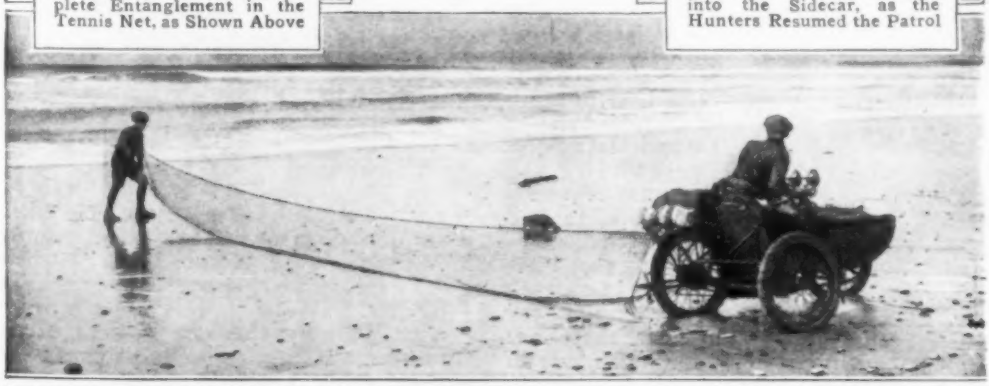
MOTORCYCLISTS GET RACCOONS WITH OLD TENNIS NET

Here Is the Raccoon-Hunting Expedition as It Started Patrolling the 75-Mile Strip of Tide Land. The Tennis Net was Tied Tightly to the Leading Motorcycle, but was Secured to the Rear Machine by Snap Hooks that Permitted Quick Removal

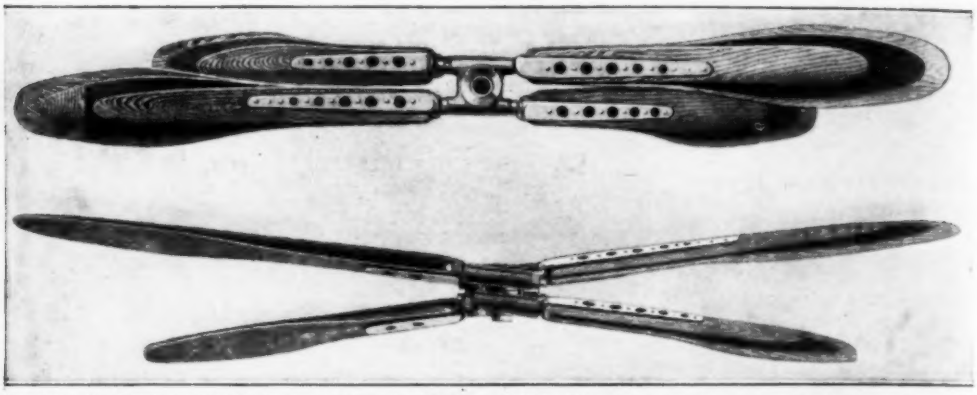
A Short, Breathless Skirmish with the Little Animal Usually Resulted in His Complete Entanglement in the Tennis Net, as Shown Above

A 75-mile strip of tide land along the California coast was recently the scene of a strange nocturnal hunting expedition, occasioned by a film company's offer of $150 for six live raccoons. At low tide one evening, two motorcyclists appeared at one end of the beach, their machines linked by an old tennis net. Lights out, and with as little noise as possible, they stole down the wet sand, one behind the other. At length the leader

From the Tennis Net the Raccoon was Transferred to a Burlap Bag, Then Dumped into the Sidecar, as the Hunters Resumed the Patrol



As the Frightened Animal Made for His Home among the Pine Trees of the Shore, the Second Motorcyclist Unsnapped His End of the Net, and Carried It at Double Time across the Fugitive's Path. The Efficiency of the Odd Hunting Scheme is Proved by the Fact that Six Raccoons were Snared, of 15 Seen during the Two Nights



The New Aerial Propeller is Shown Above in Front and Side View. Inspection of the Hub Shows How the Blades are So Held in the Sleeves That a Wide Range of Mutual Adjustment Is Possible. This 8-Foot Propeller Is of the Type Said to have been Used in Government Tests

sighted a raccoon at the water's edge, intent upon his evening meal of succulent shell-fish. The net grew taut as both machines darted forward at full speed. Alarmed, the raccoon made for the safety of the pine forest, but halfway, found his path blocked by the net. The second hunter leaped from his motorcycle with an end of the net in his hand, and soon had the quarry nicely entangled. So the hunt went on for two nights. Of 15 raccoons sighted, seven escaped, two were shot, and six were caught thus, to be sold later to the motion-picture people.

DRINKING FOUNTAINS ON BASE OF NOVEL PARK LAMP-POST

Three purposes are served by an artistic new public-park fixture, which comprises sanitary drinking fountains, watering troughs for dogs, and a lamp-post. The latter is a fluted iron column, set on a four-sided concrete base, and surmounted by a frosted-glass globe. For canine use, there are two metal basins, located near the bottom of the base, opposite each other, while for humans there are four porcelain-enameled fountains, one on each side of the base at such a height as to be convenient for both adults and children.

UNUSUAL AIRPLANE PROPELLER DEFIES CURRENT PRACTICE

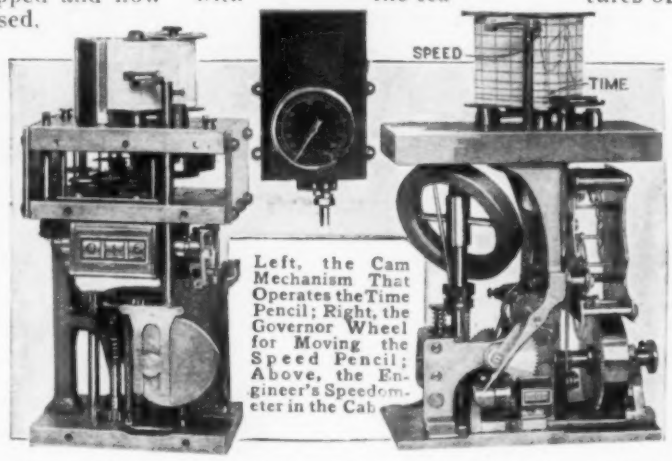
In view of the admitted inefficiency of the conventional airplane propeller, serious consideration must be granted an altogether unusual type, which, in actual flying tests at a governmental field, is said to have given increased climb and speed. The experimental air screw, with which these tests were made, consists of four blades of laminated ash and mahogany. Two of these blades are long, two short; each is bolted to an arm of metal, which fits into a sleeve in the hub, and is held there by a locking nut. This particular propeller measures 8 ft. 6 in., measuring from tip to tip of the longer blades.

As the hub sleeves are cast in pairs, and as the blades may be locked at any pitch angle, it is seen that a wide range of adjustments is possible. Whatever the relative position of the blades, however, the functioning of the new propeller is the same, the shorter blades exerting a thrust where the ordinary propeller is comparatively impotent. It is worth noting, incidentally, that this strange air screw is a development of a marine propeller which is said to have increased the speed of many motorboats used on the waters about New York City.

¶ Efficiency methods were the rule when a group of 75 electrical engineers recently moved with their families, and all their house furnishings, from Pittsburgh to Philadelphia. Blueprints of the new houses, showing the arrangement of all furniture, etc., were given to the movers at Philadelphia, who were thus enabled to prepare the houses for actual occupancy.

INSTRUMENT RECORDS MOVEMENTS OF LOCOMOTIVE

A graphic chart that tells at a glance how fast a locomotive ran at each point of its course, where it stopped and how long, and where it reversed, is the product of a new railroad instrument. The record is drawn on a tape driven from the engine axle, which moves ½ in. for each mile of track, forward or backward, and stops when the engine does. Crosslines graduate the tape in miles, and longitudinal lines in miles per hour. A pencil which starts from zero on the upper edge of the tape makes the curve which tells the story. Another clock-driven pencil keeps track of time by moving continuously back and forth across the tape, ten minutes to the trip. By laying the finished tape on a keyboard at the office, marked with the features of the division, an account of the locomotive's performance is read.



Left, the Cam Mechanism That Operates the Time Pencil; Right, the Governor Wheel for Moving the Speed Pencil; Above, the Engineer's Speedometer in the Cab

CANVAS HELD OVER CONCRETE ROAD BY WOODEN ARCHES

Light wooden arches were employed recently to support canvas over unset portions of a concrete highway in Pennsylvania, and saved the contractor who used them considerable expense for labor. Each device was 25 ft. long, and as wide as the pavement. Scantlings along the sides were joined by small curved strips, and held together with wires. Nine men shifted eight of the contrivances in 15 minutes, covering 200 ft. of road. To accomplish the same result without arches would have required an hour.

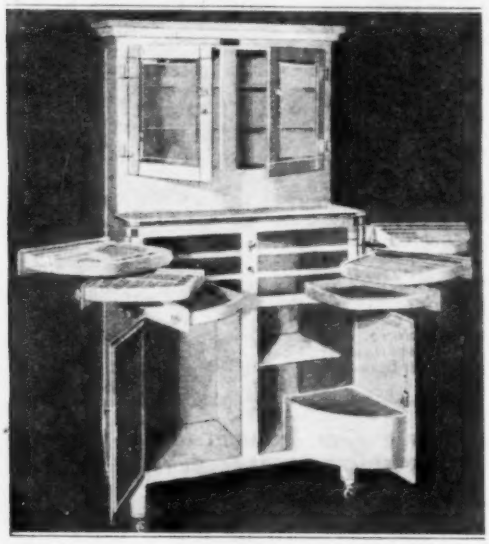
How a Pennsylvania Contractor Employed Light Wooden Arches, Which can be Shifted Easily, to Support Canvas over a Newly Made Concrete Road, is Shown in the Picture. Each Section Is 25 Feet Long

SUSPENSION BRIDGE PLANNED TO CROSS DETROIT RIVER

Construction of a $28,000,000 international bridge, this one to connect Detroit, Mich., with Windsor, Ont., is being promoted by a group of American and Canadian capitalists. As a matter of fact, the step is made almost imperative by the unprecedented industrial growth of these and near-by cities. If plans carry through, the bridge will cross the Detroit River at its narrowest point, bringing the American terminal into the very heart of the larger city. The structure will be double-decked, of the suspension type, and will handle railroad, street-car, automobile, and pedestrian traffic. One span will clear the water by 110 ft., permitting the passage of the largest lake vessels. As soon as the promoters obtain necessary information from local railroads, the matter will be taken up at Washington and Ottawa.

DENTIST'S CABINET EQUIPPED WITH SWINGING DRAWERS

Swinging drawers make a new dentist's cabinet an unusually convenient piece of furniture. The compartments are pivoted



Intended for Use in a Dentist's Office. This Novel Cabinet is Provided with Swinging Drawers, Which Are More Convenient Than the Sliding Type

at the sides of the case, and can be opened much more easily than those of the common sliding type. Another advantage possessed by the novel utility is that the contents of all the trays can be made available at one time, which is not possible with the ordinary device of this kind. Both the interior and the exterior of the cabinet are finished in white enamel.

BABY ALLIGATORS NOW TRAVEL THROUGH THE MAILS

Queer packages are common in the parcel-post service, but few are more curious than the cartons of baby alligators that now come out of Florida. So many of the winter resorters evince a desire to send one or more of the tiny saurians home, that one dealer has devised a system for packing them in a grass-lined box with a screen front, properly labeled and stamped.

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Packed in Special Boxes, Live Baby Alligators are Sent Long Distances by Parcel Post

FEDERAL GOVERNMENT TO BUY BRIGHT ANGEL TRAIL

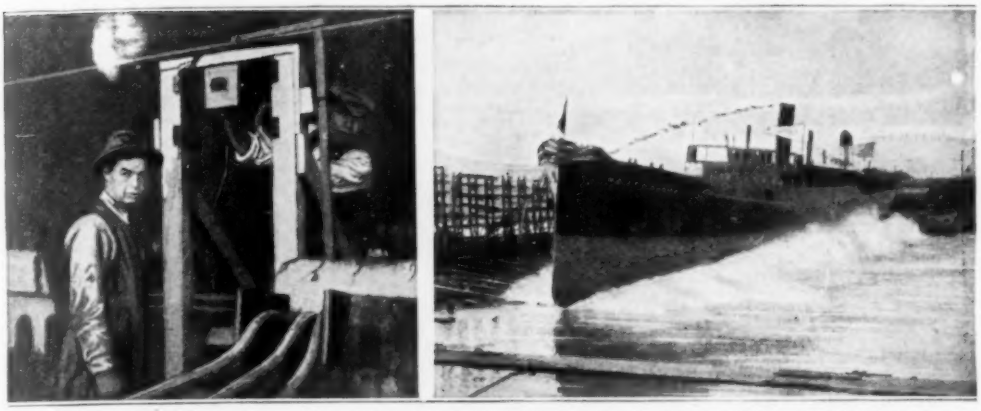
Negotiations now in progress are expected to lead to the purchase of the famous Bright Angel Trail, the main way into the Grand Cañon, by the Federal government. Constructed originally by Indians, who had been using it for years before the arrival of the white man in the region, the trail at present is owned by Coconino County, Ariz., and leased to private interests, which operate it as a toll road. Several attempts have been made by Federal authorities to dispossess the county by legal action, but in every case the latter litigant's claim to the trail was upheld by the court. Two governmental offers are being considered by the county officials.

RINGLIKE OFFICE ACCESSORY CREASES BUSINESS LETTERS

The overgrown signet ring pictured to the right is a new office accessory, made of polished metal, and meant to help fold business letters. Slipping it upon her finger, as shown, the stenographer finds that a slight pressure creases a page neatly, and without the dirty streak sometimes made, unavoidably, by perspiring hands when many letters are written daily.

WOOL SCRAP AND CELLULOSE MAKE ARTIFICIAL WOOL

By adding a small amount of glue to a solution of cellulose, and using the viscous bath for soaking all manner of wool scrap, waste, and short fibers, an effective substitute for new wool is made by a new German process. Chromium treatment, supplemented by formaldehyde and tannin, makes it waterproof, and glycerin contributes flexibility.



The Success of the Recent Launching, Pictured at the Right, is Ascribed to the Use of Guillotines, Instead of Axmen, to Sever the Retaining Cables. The Workmen at the Left are Placing One of the Guillotines in Preparation for the Event. It is Held at the Top of the Frame by the Attraction of an Electromagnet

GUILLOTINES REPLACE AXMEN IN SIDEWISE LAUNCHINGS

A big steel cargo boat was launched successfully, some weeks ago, by the throw of a single electric switch. Sidewise launchings have been precipitated hitherto by skilled axmen who chopped through the launching cables at a given signal. Inattention on the part of one man, with this old method, sometimes resulted in an uneven progress down the ways, or even in disaster. With the newly invented electric system, heavy wooden guillotines—four in this case—take the places of the axmen. The weighted blades are held at the tops of the frames by the attraction of electromagnets; when the current is broken, all the blades descend simultaneously, and the vessel strikes the water on an even keel.

NONSHATTERING SHELL MADE BY ENGLISH STEEL MILL

Ordnance experts regard as highly important the recent announcement that a large-caliber rifle shell, which will pierce the heaviest warship armor plate without shattering, has been produced by an English steel mill. While no official statement has been issued on the subject, it is generally supposed that the new projectile will be made for the British navy. For obvious reasons, details of the manufacturing process have not been revealed.

¶ During the year 1919 traffic through the Panama Canal exceeded that of any previous year. Nearly 2,400 ships, not counting naval vessels, passed from ocean to ocean.

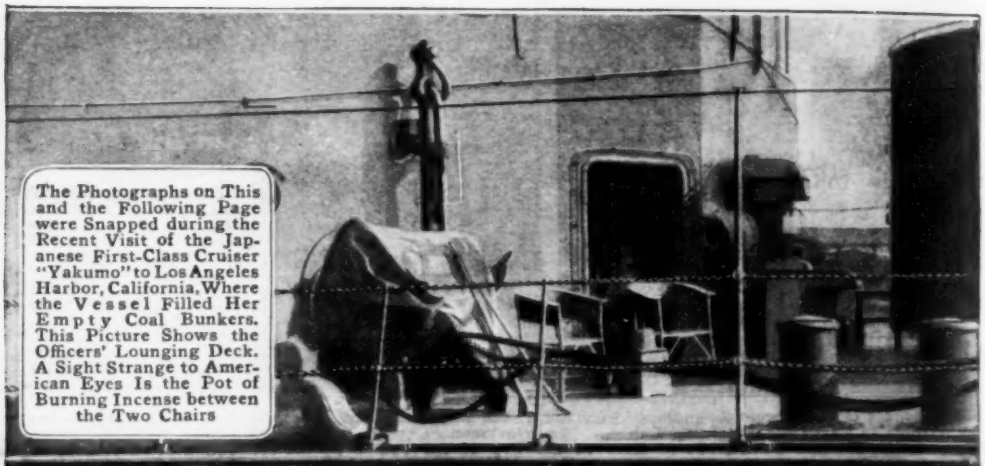
COMPRESSED-AIR CALLIOPE MADE FROM PLAYER PIANO

First cousin to the well-remembered steam calliope of the old-fashioned circus parade is a compressed-air instrument of recent construction. This last word in calliopes has been built around an ordinary player piano. Instead of depressing the keys, however, the fingers actuated by the perforated roll open and close the air inlets to the 49 whistles. These metal tubes are blown by compressed air from

This Automatic Calliope is Operated by Compressed Air. To a Player Piano have been Added 49 Whistles, an Air Tank, and a Rotary Air Pump

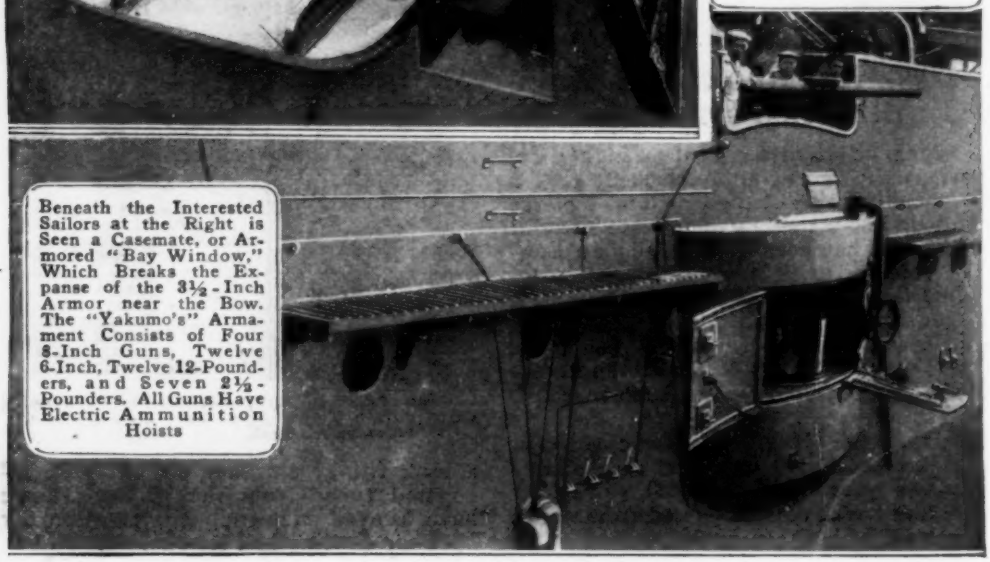
a tank fed by a rotary air pump. Syncopated tunes from the player calliope have proved tremendously popular for open-air dancing and ice skating.

DETAILS OF VISITING JAPANESE CRUISER



The Photographs on This and the Following Page were Snapped during the Recent Visit of the Japanese First-Class Cruiser "Yakumo" to Los Angeles Harbor, California, Where the Vessel Filled Her Empty Coal Bunkers. This Picture Shows the Officers' Lounging Deck. A Sight Strange to American Eyes Is the Pot of Burning Incense between the Two Chairs

Each of the Big Bow Anchors is Secured in the Rather Unusual Fashion Pictured at the Left. When Released It Slides down the Rails and into the Water. It was Learned That the Keel of the "Yakumo" was Laid at a German Yard in 1897, the Vessel being Completed in 1901. During the Russo-Japanese War It Doubtless Participated in the Scattering of the Russian Fleet before Port Arthur



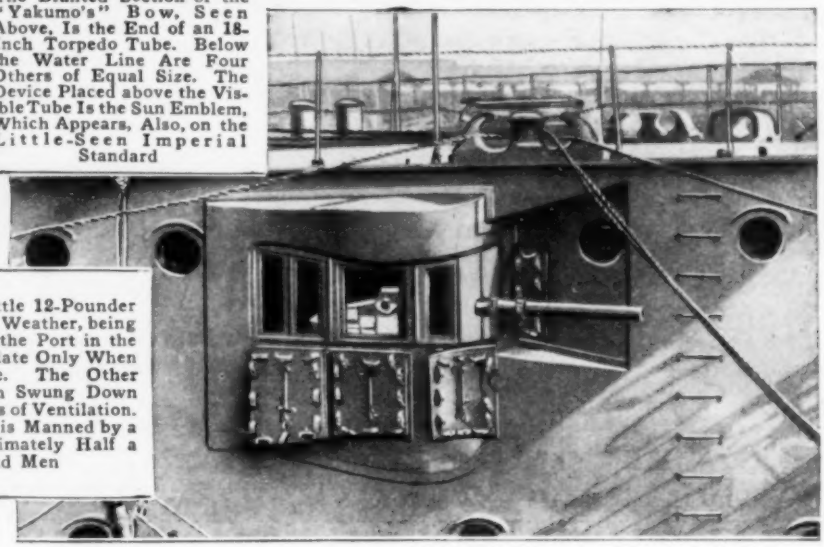
Beneath the Interested Sailors at the Right is Seen a Casemate, or Armored "Bay Window," Which Breaks the Expanse of the 3½-Inch Armor near the Bow. The "Yakumo's" Armament Consists of Four 8-Inch Guns, Twelve 6-Inch, Twelve 12-Pounders, and Seven 2½-Pounders. All Guns Have Electric Ammunition Hoists

AROUSE INTEREST ON CALIFORNIA COAST

The Stern of the "Yakumo" is Given an Odd Appearance by This "Back Porch" Which Curves Away in a Semicircle. It is Reached from the Deck by Means of the Ladder, and from Within, by Means of Steel Doors, One of Which is Seen in the Photograph

The Little Platform in the Upper Left is Seen Again in This Photograph, beneath the Great Naval Ensign. The "Yakumo" Is 434 Feet Long, 65½ Feet Wide, and Draws 23¾ Feet of Water. The Displacement Is 9,850 Tons. Developing a Maximum of 15,000 Horsepower, the Two Screws Give a Speed of 23 Miles an Hour

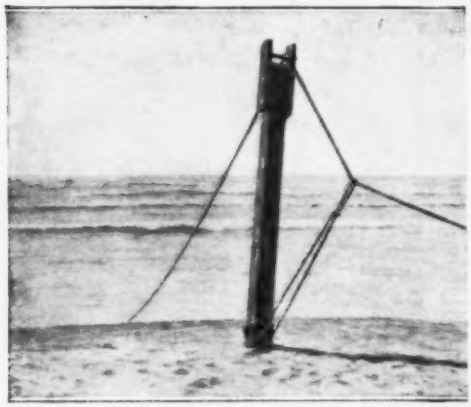
The Blunted Section of the "Yakumo's" Bow, Seen Above, Is the End of an 18-Inch Torpedo Tube. Below the Water Line Are Four Others of Equal Size. The Device Placed above the Visible Tube Is the Sun Emblem, Which Appears, Also, on the Little-Seen Imperial Standard



Usually This Little 12-Pounder is Kept Out of the Weather, being Pushed through the Port in the Hinged Armor Plate Only When Desired for Use. The Other Plates have been Swung Down Here for Purposes of Ventilation. The "Yakumo" is Manned by a Crew of Approximately Half a Thousand Men

LIFE LINES ON OCEAN BEACH SECURED IN EFFECTIVE WAY

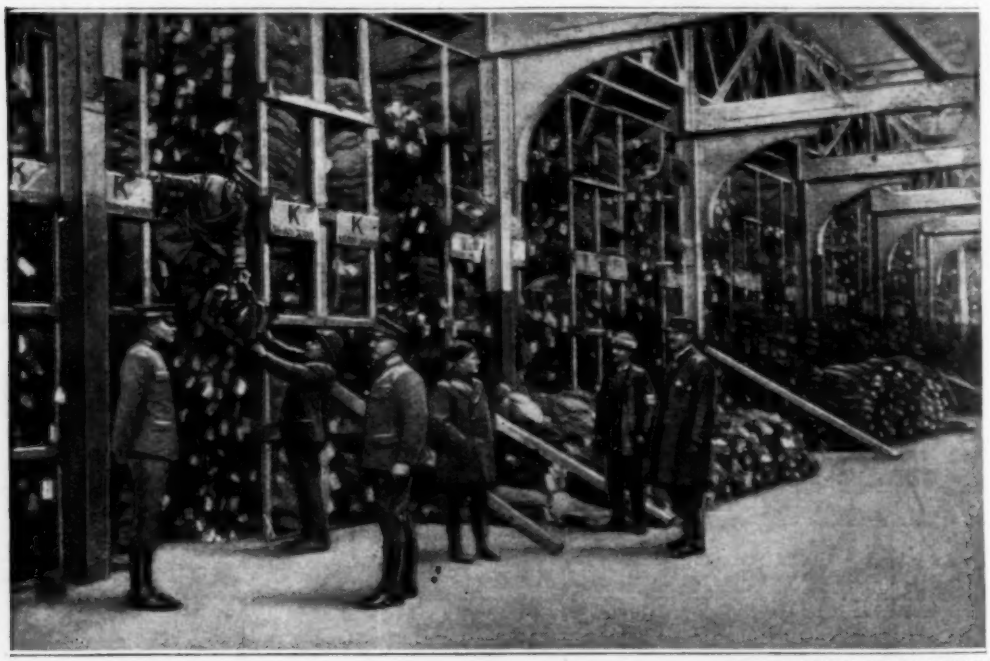
The long life lines along one ocean bathing beach were formerly tied immovably to the tops of tall uprights at the water's edge. The weight of the bathers and the continuous pull of the undertow were thus given a leverage that frequently toppled over the poles, much to the annoyance of the life guards. They have now remedied the condition, however, by a simple bit of engineering. A life line is no longer tied to an upright; instead, it is passed over a piece of pipe, held horizontally between two vertical supports. Then it is carried up the beach and tied to the base of an anchoring post. The pulling action of the line serves only to push the pole more firmly into the sand.



Tied to the Top, the Life Line Formerly Tended to Upset the Pole. By Passing It over the Length of Pipe, Then Tying It to an Anchoring Post, the Trouble was Eliminated

NAVY TRANSFERS RAILWAY-GUN MOUNTS TO ARMY

Deciding that in future wars the navy will confine its operations entirely to the water, the joint Army and Navy Board at a recent meeting recommended the transfer to the army of seven railway mounts for 14-in. rifles, which were manufactured for the navy during the World War. Favorable action was taken on the recommendation. Some of the transferred mounts were in actual service on the western front.



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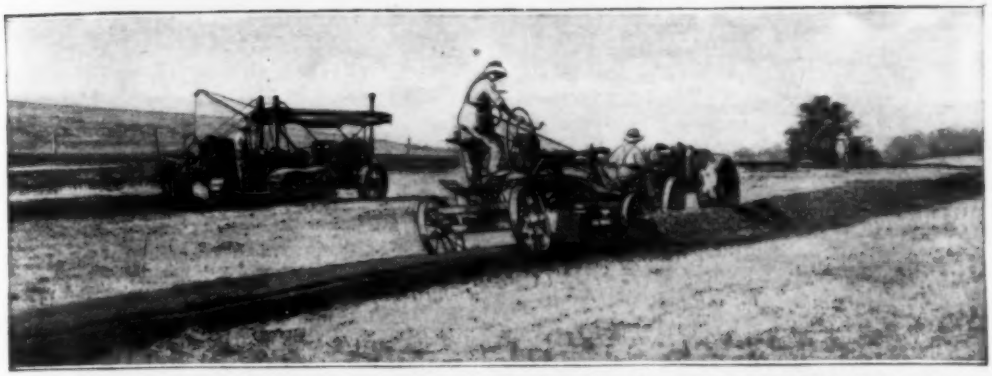
UNCLAIMED ARMY BAGGAGE PILED MOUNTAIN-HIGH

SEVERAL million American soldiers will testify that the only task comparable with getting a drink of water at a French café was that of keeping an eye on barrack bags, bedding rolls, and truck lockers. Inevitable confusion at ports of embarkation and debarkation, and the inexplicable French system of checking baggage over the railroads, combined to separate thousands of Yanks from their worldly goods. In the photograph above are seen a few of the 170,000 pieces that, in consequence, are now accumulated at Hoboken, N. J., waiting for claimants to appear.



The Trench Traversing This Field was Dug by a Big Ditching Machine, and the Drain Tile Laid along the Smooth Bottom. Then a Road Scraper was Hitched to a Tractor, the Scraper Blade was Set at a Sharp Angle, and the Dirt Pushed Back into the Trench

TILE DRAINS QUICKLY BURIED WITH SCRAPER AND TRACTOR

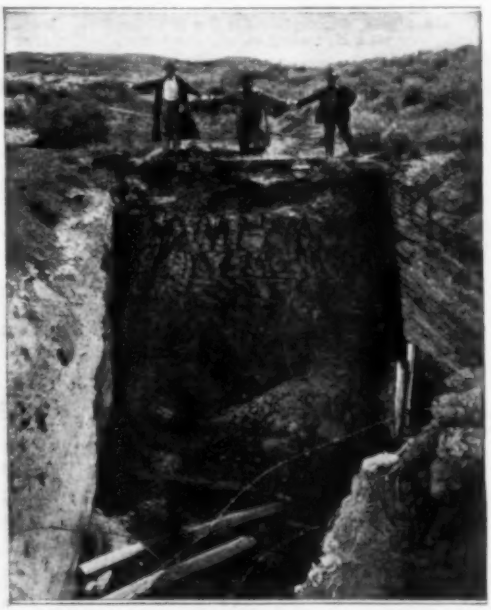
Digging trenches for drain tiles with a ditching machine is now common practice, but filling them in again with the same mechanical celerity is more unusual. An Ohio farmer effected an enormous improvement over the hand-labor method by hitching a road scraper to a tractor, and driving along the ditch. The scraper blade was set at an angle that shoved practically all the dirt back into the ditch, and the only limit to its capacity was the speed of the tractor.

NATURE PACKS TARRY MINERAL INTO CRACKS IN UTAH DESERT

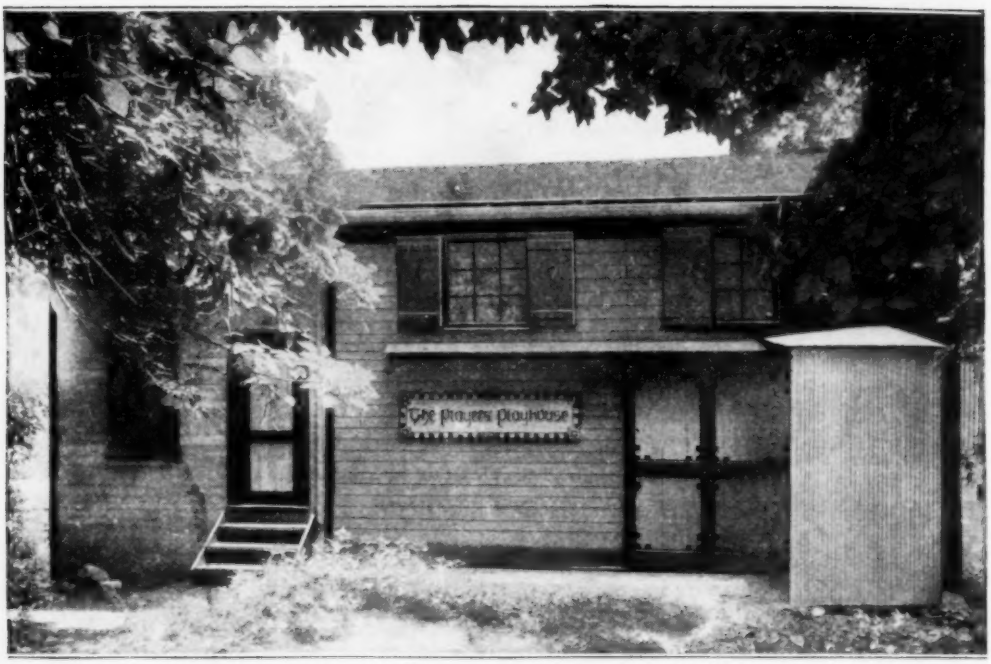
Lining the floor of the desolate Uintah Basin in eastern Utah is a most remarkable series of vertical cracks varying in width from 1/16 in. to 18 ft., and in length from 100 yd. to 10 miles. In these fissures, as in the vaults of a treasure house, nature has stored many hydrocarbon products, and chief among them, a substance called "gilsonite" or "uintahite." The mineral is a variety of asphalt, is black in appearance, and of brilliant luster except when exposed to the weather.

Though the substance is comparatively little known, it has proved its worth in many industries. One company mixes it with asphaltic limestone to produce a paving material. Another substitutes it for rubber in the manufacture of a so-called rubberized fabric. Because of its ability to resist acids, it is used to paint smokestacks and battery boxes. On the waterfront, it is applied as a coating to wooden piles, and to sea walls of masonry and concrete.

As might be imagined from the above description of its occurrence, gilsonite is easily mined with a pick. Blasting is unnecessary, as the brittle material falls cleanly away from the smooth walls of the cracks. The shafts and tunnels of a gilsonite mine must be well ventilated, however, as the brown dust penetrates and irritates skin and lungs. Insoluble in water, and quickly softened by body heat, the dust is removed from the body only with annoying difficulty. The miners usually wear respirators and wash with prepared chemical solutions. Transportation, too, usually offers difficulties, as good roads are few and railroads fewer.



Into a Broad Fissure between the Rock Masses of the Dreary Uintah Basin has been Sunk This Shaft, for the Extraction of One of America's Least Known Minerals

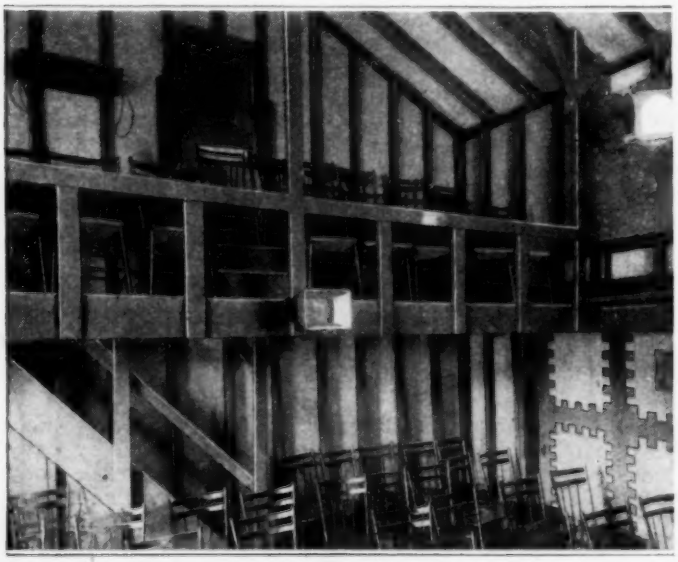


This, the World's Smallest Theater, Was Once a Prosaic Barn. Purchased by Local Lovers of the Drama, the Barn was Remodeled for Its Present Use. Most Attention was Paid to the Interior; That the Exterior was Not Neglected, However, Is Evident from This Photograph of the Main Entrance

THE SMALLEST THEATER IN THE WORLD

By ROBERT H. MOULTON

THE smallest theater in the world is to be found in Ypsilanti, Mich. Because it is of the species known as "the little theater," and the performances are looked on variously as "highbrow rantings," "aesthetic explosions," and "dilettantism extraordinary," by a simple system of logic we arrive at the point, or points, that Ypsilanti has the highest of highbrows and the loudest of aesthetic explosions.



The Auditorium of the Littlest Theater Measured Only 12 by 18 Feet; So a Tiny Balcony was Built, Bringing the Capacity up to 50 Seats

As usual, the professional "smarty" who exists in the lair of the newspaper paragraph and vaudeville stage, and who evolves bevo-epigrams at the expense of something he or she cannot understand, is all wrong. The little theater has long gone past the joke stage. Day by day it is becoming more surely a fixture in theatrical history, and its mission more sharply defined: its yeasting function on the mass more evident, and its power of entertainment more insistent.

A business man is the moving spirit in the "littlest theater." By day he is president of a bank, and not long ago was a

major in the American Red Cross organization on active duty in France. Associated with him are men and women of Ypsilanti whose occupations are as drab as that of banking, but whose dream hours are as colorful as the wand-waving minds of the world's greatest dramatic writers can make them.

The players were formerly a club that met and read without attempt to portray lines dramatically. Ambition called for that red-headed stepchild of the drama, elocution; and from elocution to costumes and make-up was but a step. The players began to have a most uproarious time among themselves. Their friends and neighbors expressed more and more insistently a desire to observe.

This Scene, from a Recent Production on the Stage of the Smallest Theater, Shows One of the Many Artistic Sets. The Electrical Equipment, Also, Is Complete. Beneath the Stage Are the Dressing Rooms, a Kitchenette, and the Furnace Room

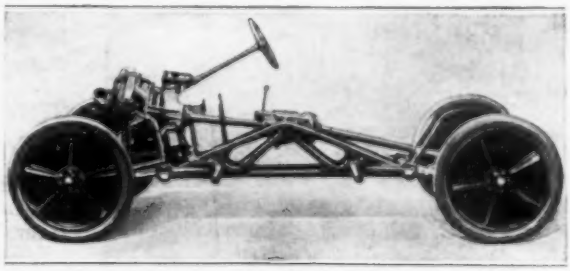
And thus came the littlest theater. A barn behind the public library was purchased and remade into a playhouse. The exterior was painted, decorated, and lantern-hung after the manner of the Elizabethan period. The interior was transformed. The building is 18 by 36 ft.; the auditorium, constructed with a balcony, although only 12 by 18 ft. in size, comfortably seats 50 people. From curtain to sky dome, the stage has a depth of about 23 feet.

From the middle of the stage one descends to a basement where are located two large dressing rooms, a green room, and a furnace room. The green room can be quickly converted into a kitchenette, and has running water, an electric stove, tables, etc. The players have their own dishes, and after every program they serve a supper.

The Ypsilanti players do not plan to exploit their playhouse as an art theater, yet in their work they have gone a long way in this direction. A suitable play, suitably staged, is always a prime consideration. The theater has all possible properties and three regular interiors, and with draperies, screens, pylons, special windows, and a sky dome, many decidedly artistic settings have been achieved.

FEATHER-WEIGHT AUTO BUILT LIKE AIRPLANE

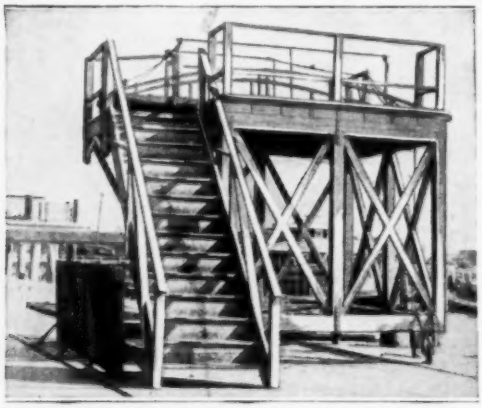
Many innovations in English automobile design for 1920 show how considerable has been the influence of war-time airplane manufacture. One little car, in particular, exemplifies this use of aeronautical practice to improve and simplify the chassis. The frame is composed of two fan trusses which carry the gear box at their apexes, light weight being gained in this way without any sacrifice of strength or rigidity. On a vertical bulkhead between the front wheels is mounted a five-cylinder radial engine, which is air-cooled by the suction of fan blades built into the flywheel behind. The cylinders, normally stationary, may be rotated easily for inspection and repair.



The Rotary Engine, on Its Vertical Bulkhead, and the Fan Trusses Carrying the Transmission Box, Show How the English Manufacturer Borrows the Practices of Airplane Construction

MOVABLE PLATFORM ON WHARF FOR UNLOADING SHIPS

Unloading passengers from vessels that dock beside the municipal wharf at San Diego, Calif., is expedited by a movable

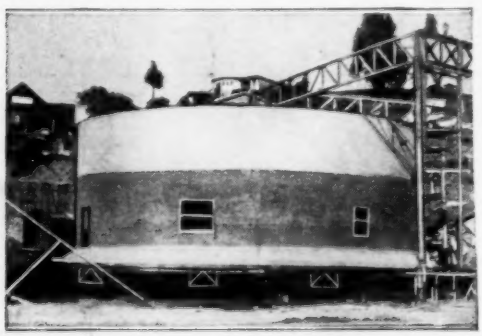


On the Municipal Wharf at San Diego, California, This Movable Platform Serves to Hasten the Unloading of Boat Passengers on Upper Decks

wooden platform. The device is mounted on casters, and provided with a stairway. When pushed against the side of a ship, the platform permits persons on the upper deck to debark simultaneously with those on the lower deck. An ordinary gangplank is employed to connect the platform with a boat.

CYLINDRICAL SCENERY GIVES SPEED ILLUSION IN MOVIES

The dazzling speed shown by the custard-pie movie comedian after a typical encounter with a policeman, is effected in one motion-picture studio by the use of a great cylindrical "back drop." Resembling a gas tank pivoted at the center, the apparatus carries around its lower



This Side View of the Outdoor Studio Shows the Cylindrical "Back Drop," with Its Circular Track Which Revolves beneath the Feet of the Actor, on the Stage at the Right

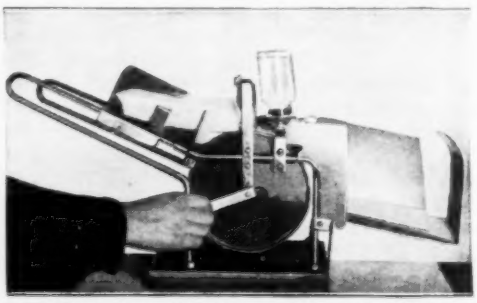
circumference a wide track. Here the comedian runs at top speed, while the big cylinder revolves in the opposite direction, and at the same speed, thus keeping him continuously in front of the camera.

THOUSANDS OF FREE RIDES FOR POPULARIZING AUTOS

Free rides for everybody were the feature of an advertising campaign conducted for one week recently by an auto agency in an Iowa town. Cars for public use were posted at all prominent street corners, and the drivers carrying the greatest total number of passengers received prizes. Altogether, 2,337 free rides were given, the passengers being invited to record their opinions of the cars.

ENVELOPE-SEALING APPLIANCE DESIGNED FOR OFFICES

Another convenience for the office is now on the market in the form of a self-feeding envelope sealer. In this device, a revolving cylinder, operated by a crank, is arranged to draw the envelopes, one by one, from the feed table, and to

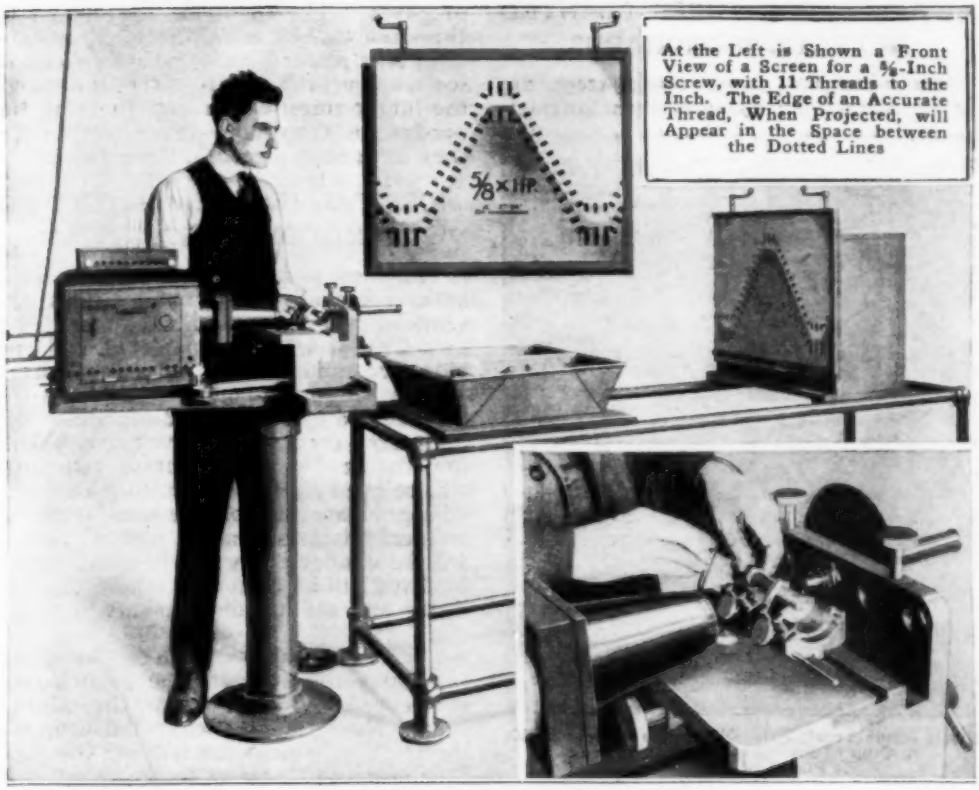


Envelope Sealer: The Picture Shows the Feed and Discharge Tables, and the Revolving Drum

discharge them, ready to be stamped and mailed, at the opposite end of the machine. The flaps are moistened by a metal arm, to which water is supplied by a small tube, connected with a glass container.

SIMPLIFY PROJECTION METHOD OF SCREW-THREAD GAUGING

Gauging screw threads by projecting a magnified picture of them has been considerably simplified by an instrument now offered. Instead of throwing its image on a ceiling mirror, as described in this magazine last June, the new apparatus projects the outline of the thread under



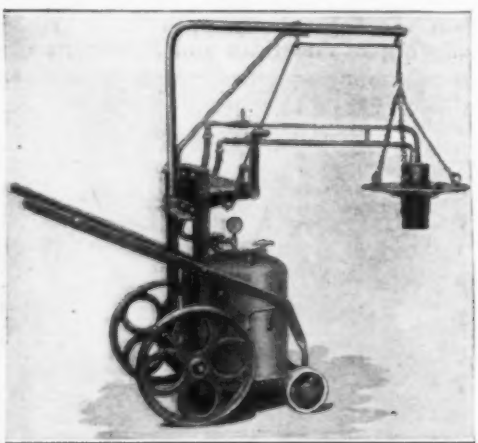
At the Left is Shown a Front View of a Screen for a ⅝-Inch Screw, with 11 Threads to the Inch. The Edge of an Accurate Thread, When Projected, will Appear in the Space between the Dotted Lines

Projection Lantern for Gauging Screw Threads: The Device Throws a Highly Magnified Image of the Threads on a Screen, Thus Disclosing the Smallest Irregularities. At the Right, Below, an Operator is Placing a Screw in the Cradle between the Lenses

test, magnified as much as 200 times, on an accurate chart fixed a short distance in front of the lens. The chart, adjustable for position, rests on a rigid iron frame, while the projecting lantern is mounted on a substantial iron pedestal. The screw to be tested is held between the lenses by an accurately machined cradle. Not only are the most minute irregularities immediately revealed by this method, but wear on gauges or samples is completely eliminated.

LADLE-LINING DRIER MOUNTED ON TWO-WHEELED TRUCK

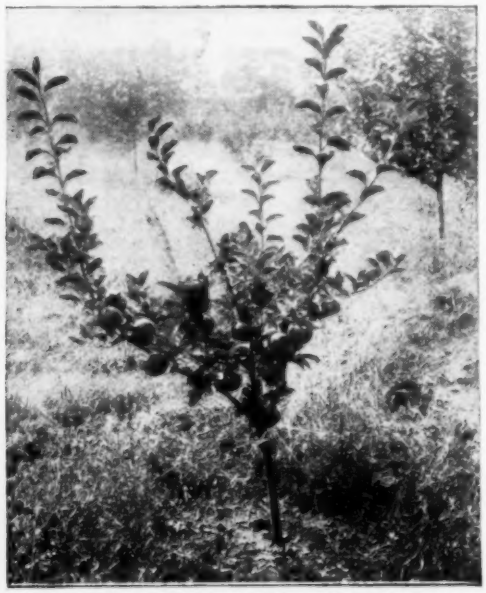
A mobile device for drying the refractory lining of large foundry ladles is the product of an eastern factory. Various oils can be used for operating the heater, which comprises a two-wheeled hand truck, bearing a 20-gal. tank and a burner, the latter suspended from a swinging arm in such a way that it can be lowered or raised by turning a crank. A deflecting plate, attached to the burner, is designed to direct heat toward the bottom of a ladle. Fuel and compressed air are conducted from the tank to the burner pipes by means of hose.



Refractory Linings in Foundry Ladles are Dried in a Few Minutes with This Oil-Burning Device, the Burner of Which Hangs on a Swinging Arm

DWARF APPLE TREES PLANTED IN EASTERN ORCHARDS

Quick-bearing dwarf apple trees are being planted by some eastern horticulturists as a means for shortening the time that ordinarily must elapse before new orchards begin to yield. Specimens of the small variety, which bears three years after it is planted, and continues to do so for seven years thereafter, are set between the larger trees, which sometimes do not produce a crop until seven years after they have been placed in the ground.



Dwarf Apple Tree: This Diminutive Variety Yields a Crop of Fruit Three Years After It is Placed in the Ground

HOSPITAL IN PANAMA CITY TO BE MODERN INSTITUTION

The finest hospital in the western hemisphere, outside the United States and Canada, is being constructed near Panama City, and, when completed, will provide accommodations for 600 patients. Eleven reinforced-concrete buildings will be occupied by the institution, which will be located on a 14-acre tract overlooking the Pacific Ocean. Separate structures will be used to house infectious cases. A post-graduate school for the study of tropical diseases, and a nurses' school, will be conducted by the hospital. Other features will be a modern laboratory, and X-ray and radium departments.

¶The largest radio station in the world, the Lafayette, built for the French government at Bordeaux by the United States Navy, is practically finished, and the electrical equipment is being installed. It is declared that any receiving outfit in the world will be able to pick up the messages from this powerful station.

BOLSHEVIST ARMY CLOTHED IN NONDESCRIPT GARB

A photograph snapped at a recent meeting of American and Bolshevist officers to arrange for the exchange of prisoners gives opportunity for an interesting study in costumes. The Americans, first and fourth from the right, are clothed unpretentiously in the army's regular winter equipment. The Russians, on the other hand, present a nondescript appearance. The commander wears a curious leather outfit; his aide-de-camp, second from the right, displays French breeches and boots, an Italian tunic and cap, and a German pistol belt. It is probable that the antecedents of the two outfits at the left would make blood-curdling reading.

This Photograph was Taken during a Recent Meeting of American and Bolshevist Officers for the Arrangement of an Exchange of Prisoners. The Makeshift Uniforms of the Russians Are Characteristic

OBTAINING THE SECRETS OF THE UNBORN FLOOD

By J. CECIL ALTER

Snow Surveyor on His Way to Work: In the Distance Is One of the Peaks of the Sierras

THE American River in central California, discharging into the sluggish Sacramento near the capital city, is sustained almost exclusively by the melting snows of the high sierras where its principal feeders are born. The precipitation of winter in this region usually maintains a saturated watershed until late springtime, and builds a snow supply upon which the stream feeds through the droughty summer.

With the first important warmth of springtime, especially if attended by downpours of rain—as is frequently the case—the softening snow rushes from the mountain slopes into the minor streams, and the erstwhile slumbering American, like many another pan-climatic stream, heading in the frigid zone and ending in a warm temperate climate, goes on a rampage. More or less disaster attends these floods, depending partly upon the degree of warmth and the amount of rainfall that starts them, but principally upon the amount of snow that has accumulated over the mountainous portion of the watershed.

The damage by flooding along the American extends to the Sacramento River, whose low, level banks are easily overflowed: below the mouth of the American, by the excess of water received, and above, by the retarded flow and the accumulation of waters from the upper Sacramento. Thus a relatively large population is keenly concerned as to the probable proportions and characteristics of the forthcoming floods every spring. If these floods are to be light and unimportant, there is the opposite concern lest irrigation and hydroelectric supplies be seriously curtailed; and if the flood or spring run-off is to be heavy, the questions whether excessive damage can be averted or mitigated, and whether some of the precious moisture can be caught and conserved for late summer use, are equally grave.

Formidable Difficulties are Encountered by the Surveyors after a Few Hours of Sunshine Soften the Snow

It is announced that these questions are to be answered somewhat exactly for the first time beginning this spring, by a coöperative snow survey undertaken by the states of California and Nevada, and the United States Weather Bureau.

Included in the Surveyor's Outfit Are a Sampling Tube, a Scale, and a Thermometer. In the Picture, the Latter can be Seen at the Left, Hanging on a Tree

Since the agricultural, hydroelectric, and other interests in both states have a very important and increasing interest in the prospective summer flow and spring-flood volume, the new arrangement provides for 18 surveying parties, who will measure the depth, density, water equivalent, and general extent of the snow fields in all the important watershed basins on both sides of the Sierra Nevada Mountains, from Tehachapi in south-central California, to the Oregon boundary.

This amounts to an extension of the snow surveys that have been made for a few years in the Tahoe-Truckee, Walker, Carson, and Humboldt basins. The general scheme is practically the same as that carried out for some years by the Salt Lake City engineering depart-

ment, the United States Reclamation Service, and some private corporations, for anticipating summer stream flow from limited but important watersheds of the West.

Sometimes the Snow Is Deeper than the Length of the Tube, and a Little Excavating Is Necessary

It is stated by the surveyors that the knowledge gained will not only be of increasing usefulness in the study of flood control and utilization, and enable water users to estimate some months in advance the approximate character of the stream discharge in spring and summer, but will ultimately be helpful in planning and installing storage reservoirs to restrain the floods and conserve the waters of all the streams affected.

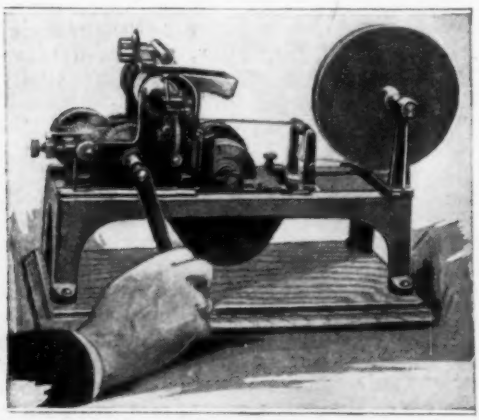
The surveys will be made in March, April, or May, depending upon the elevation above sea level of the watershed and on the average time of spring-flood run-off for the individual streams. The apparatus consists of a cutting or sampling tube of moderate diameter, but of sufficient length to penetrate the entire snow layer. A core or sample of the snow is thus withdrawn, and weighed in the tube, on scales graduated to show the water equivalent of the sample.

The surveyors are equipped with aneroid barometer, thermometer, compass, and such other equipment and supplies as may be necessary to enable them to find their route and elevation over the mountains, and subsist away from settlements for some weeks at a time. Measurements are seldom made in the local drifts or blow-overs of unusual depth and density, for these will vary, not so much with the general snowfall as with the winds that cause them. Principal attention is given, however, to the broader basins and more representative areas where the deposits are more comparable from year to year, and where the measurements obtained will be more representative of the general snow deposits.

After the snow stores and accumulations of the winter have in this manner been opened and inventoried, the forthcoming flood has given up its greatest secret, and uncertainty is eliminated.

NEW OFFICE DEVICE PREPARES TYPEWRITER RIBBONS

In large offices, where many stenographers are employed, a crank-operated typewriter-ribbon inker, recently placed on the market, may prove to be a valuable appliance. White tape is drawn from a large reel, passed through an ink container, and then rewound on an ordinary writing-machine spool. The machine is equipped with a measuring device, which includes a bell that rings when the proper amount of prepared fabric has been accumulated on the spool.



Typewriter-Ribbon Inker: The Device is Intended for Use in Large Offices, Where Many Stenographic Supplies are Required

LAW TO PREVENT EXPORTATION OF HELIUM IS PROPOSED

So small is this country's supply of helium, a noninflammable gas used for filling balloons and dirigibles, that certain government officials advocate a law to prevent its exportation. Foreign demand for the substance is declared to be great enough to exhaust the domestic stock in a very short time, unless restrictive legislation is put into effect. It has been suggested that a $5,000 fine and five years' imprisonment be imposed on violators of the proposed regulation.

¶ The country roads being impassable, a Kansas real-estate dealer recently carried a prospective purchaser to a remote farm property by airplane. The customer inspected the land from a low altitude and on the return closed the deal.

Rescued Canoeists are Given First-Aid Treatment, and Allowed to Bathe, While Their Clothes are Washed and Ironed by Electricity, in the Building at the Right

THOUSANDS USE CHARLES RIVER CANOE COURSE

Probably nowhere else in the world are there to be seen so many canoes, water area considered, as on the Charles River, near Auburndale, Mass., during the summer months. On some occasions, nearly 5,000 of the light craft have floated on the popular course at one time. An amusement park, maintained by the state on the land adjacent to the stream, is provided with several dance halls, a museum, and a zoölogical exhibition, besides numerous pavilions, where band concerts are given at frequent intervals in warm weather. Among the buildings is one used as headquarters for policemen and life-savers, and as a station for the treatment of accident victims. Rescued canoeists are supplied with bathrobes and towels in this structure, and permitted to bathe, while their wet clothing is washed and ironed by electrically operated machinery. No charge is made for this service. Attendants never reveal the names of persons assisted in this manner.

Typical Holiday Crowd on the Charles River, near Auburndale, Massachusetts: When the Picture was Taken a Band Concert was being Given in the Amusement Park Adjacent to the Water. The Course Sometimes Accommodates Nearly 5,000 Canoes

ROUGH STONE TOWER ERECTED AS MEMORIAL TO NORSEMEN

Nearly five centuries before Columbus sailed to America, according to some historians, a party of Norsemen landed on

To Mark the Supposed Site of the First European Settlement in North America, This Tower was Built at Auburndale, Massachusetts

the northeastern coast of the continent, and a few years later established a colony. As a memorial to these early explorers, a rough stone tower has been erected at Auburndale, Mass., a town that is believed to occupy the same site as the legendary settlement. Investigation has failed to reveal any traces of building ruins in the vicinity, but has resulted in the finding of several old stone walks, which are thought to have been constructed by the inhabitants of the ancient village.

MAGNESIA STUCCO ON TIMBERS PROTECTS MINES FROM FIRE

A coating of magnesia cement on the timbers of mines is declared to be an economical and efficient assurance against fire, especially in the arid regions where timber becomes highly inflammable and is difficult to replace. The magnesite stucco, which is abundantly available on the Pacific coast, is applied in two coats, each ¼ in. thick, putting the second on before the first has set. When dry, it is elastic, adheres firmly to almost any surface, and is stable and durable. It is an insulator, and resists fire, water, and climatic changes.

PREDICT TEN MILLION AUTOS IN USE BY END OF YEAR

If the use of autos increases this year at no more than the rate of gain of the two past years, more than 10,000,000 cars and trucks will be in service by next January. This means, roughly, a vehicle for every third family in the country. The total registration for 1919, recently compiled, was 7,555,269, an increase of 26 per cent over 1918. The previous year's gain was 23 per cent. The state of Washington made the greatest gain of 1919 with 48.1 per cent, and North Dakota the smallest with 1.7 per cent. New York State led the list with 600,000 cars, while Nevada was the tail ender with 9,305. New York, Pennsylvania, Ohio, Illinois, and California combined had 2,445,536 cars, nearly a third of the country's total listing, and more than all of Europe.

TOOL FOR LAYING DRAIN TILE IN NARROW TRENCHES

Farmers in some parts of the country are employing an ingenious labor-saving implement for laying drain tile in the deep, narrow trenches cut by ditch-digging machines. The tool is composed of an 8-in. strip of iron, bent at right angles near the middle, and fastened to the end of a long wooden handle. By inserting the protruding portion of the metal in a tile, the latter can be lowered into place by a person standing beside the excavation without stooping.

Drain Tile can be Laid in a Trench That Is Not Large Enough to Accommodate a Man, with the Tool Shown in the Picture

SHALES WILL SUPPLY OIL WHEN WELLS GO DRY

By W. F. WILCOX

It Is to Shale Masses, like This One in Utah, That the World will Turn for Its Oil When the Subterranean Petroleum Reservoirs Are Dry

SCIENTIFIC estimates indicate that the oil resources of this country may be exhausted before the end of 1930. What will the millions of automobiles, trucks, tractors, and aeroplanes do for fuel when oils and gasoline are gone?

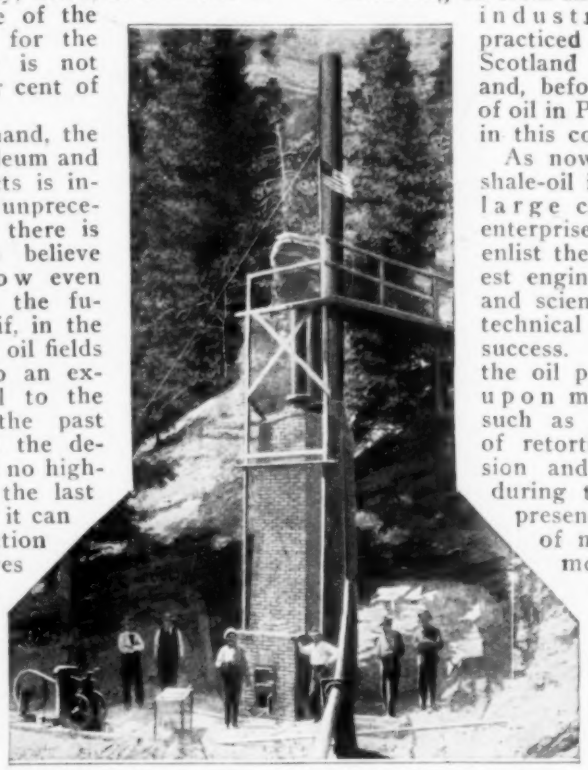
In 1916, America's oil reserves were placed at 7,600,000,000 bbl. Since then about one billion barrels have been produced. Small discoveries have been made and added to the known reserves, but their total has been but a small percentage of the amount withdrawn. To keep pace with this depletion, discoveries of new pools would have to be equivalent to 1,000,000 bbl. a day, while, as a matter of fact, the estimate of the total discoveries for the last three years is not more than 20 per cent of this amount.

On the other hand, the demand for petroleum and petroleum products is increasing at an unprecedented rate, and there is every reason to believe that it will grow even more rapidly in the future. But even if, in the next decade, new oil fields will be found to an extent proportional to the discoveries of the past three years, and the demand increase at no higher rate than in the last ten years, so that it can be met by production from the reserves and from the new fields, the total oil resources will be exhausted before the end of 1930.

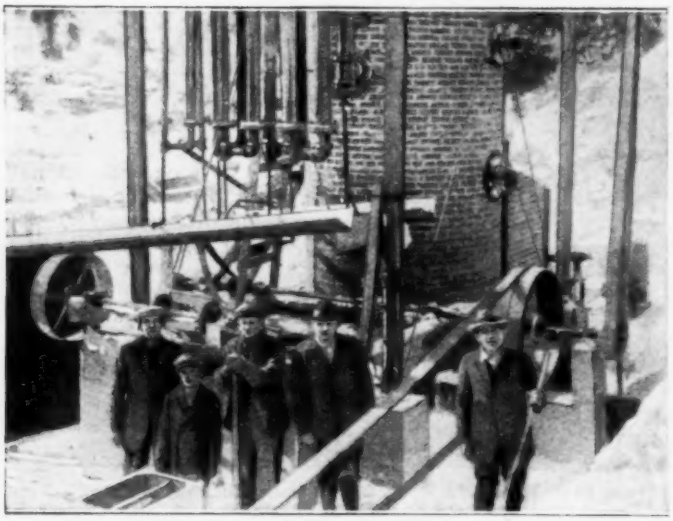
The only substitute source known at present, upon which hope can be built, is shale oil. Colorado has 2,000 square miles of lands underlaid by immense deposits of such rock. Millions upon millions of tons of these shales will yield from 40 to 50 gal. of oil per ton.

Extracting oil from shales is not a new industry. It has been practiced in France and Scotland for many years, and, before the discovery of oil in Pennsylvania, also in this country.

As now conducted, the shale-oil industry requires large capital and is an enterprise which must enlist the aid of the highest engineering, chemical, and scientific skill for its technical and commercial success. The quality of the oil produced depends upon many conditions, such as the temperature of retorting; the admission and control of air during the process; the presence and quantity of moisture; the movement of the charge through the retort; the method of applying heat, and other things. Normally, and under proper conditions, the shale oil should yield gasoline, kerosene, light



This Little Plant is Said to Be the First Continuous-Process Retort of Commercial Size Ever Operated in the United States. The Oil Shale is Fed In at the Top and Drops Out at the Bottom as "Spent Shale"



This Glimpse of the Plant Shows the Condenser Pipes Where the Gases Liberated from the Shale Cool, and Change into Oils of Various Character

and lubricating oils, paraffin wax, tars, cokes, and ammonium sulphate in commercial quantities.

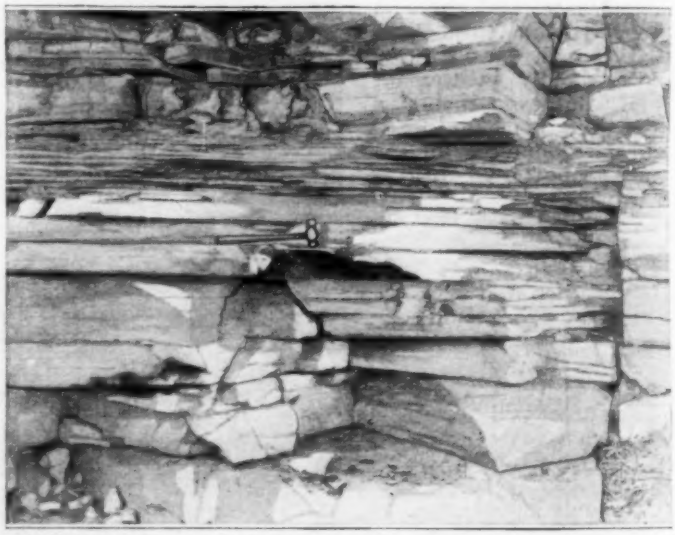
After the oil is extracted it is a complex problem to refine it. Shale oil is quite distinct from ordinary petroleum, and is composed of hydrocarbons physically and chemically different, and requiring different treatment. Numerous processes are being tried out. Some small plants are being installed in the shale fields, and two or three are in operation. In addition to the staple products named above, there are—as in the petroleum industry — many possible by-products, such as dyestuffs, medicines, materials for high explosives, and a long list of chemicals. Whether these can be obtained in commercial quantities, and at such cost as to be profitable, is still undetermined.

Besides Colorado, Utah has 5,000, and Wyoming 8,000 square miles of oil-shale lands, altogether some 15,000 square miles, while actual oil territory in the United States today is less than 4,500 square miles. Nevada, California, Arizona, and Oregon also have small areas. Oil shales must not be confused with oil sands. The oil shale is a material out of which oil can be obtained by distillation by the application of heat.

The Colorado shales are said to contain reserves from which it will be possible to extract 20,000,000,000 bbl. of crude oil, 2,000,000,000 bbl. of gasoline, and 300,000,000 tons of ammonium sulphate, a compound especially valuable as fertilizer.

A plant that recently has been installed in western Colorado produces oil by continuous operation, and is the first commercial-size installation of its type in the United States. A crusher, beside the retort, discharges its product through a chute into a bucket elevator, which in turn carries it to a hopper at the top.

As the shale feeds into the inside cylindrical chamber of the retort, it is gradually lowered by a scroll, turned by gears and pulleys in the pit at the bottom. The heat is best applied gradually, and in bringing the shale in at the top or cooler end, where the temperature is about 400° F., and gradually dropping it to the bottom, where the heat reaches 1,000°, the

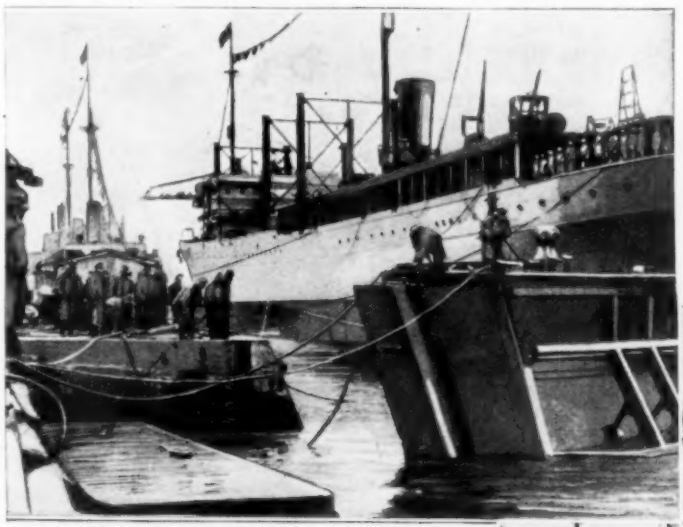


This Is Oil Shale as Usually Found. According to the Latest Surveys, Such Deposits Are Common over Some 15,000 Square Miles of Territory in Colorado, Utah, and Wyoming

maximum economy of operation is attained. After the shale has passed down through the retort, it drops into a tank of water, and is known as spent shale. It must be kept in mind that the oil does not exist in the shale as oil; only the various elements are there, and when they are brought to a gaseous state, they recombine to form oil; leaving, however, a certain percentage of permanent gases which yield no oil, as well as some products that require other equipment for their separation, but contribute their fraction to the total value.

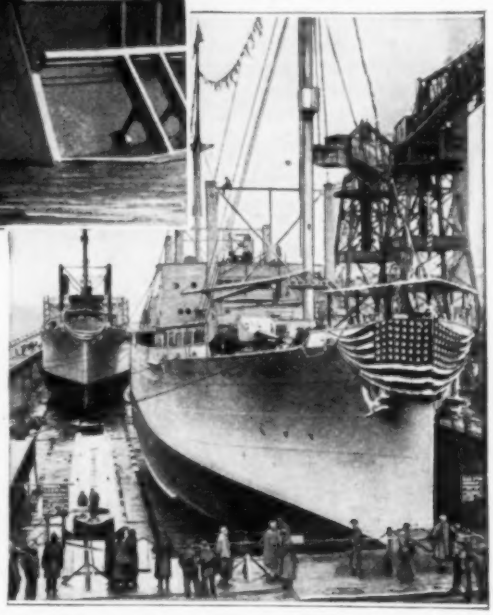
When the gas is driven out of the shale through the application of heat from the furnace, the gases are drawn off through pipes, the draft necessary to carry them away resulting from the continual condensation. These pipes pass through the stack portion of the plant, and are connected to gas rings on the retort, which extend all the way around the retort so that they cannot become completely stopped if any shale should work into them. As the gas passes out into the condenser it is cooled gradually, the heavier oils being condensed first. In order to hasten this process, water-spray pipes are used, especially at the end where the lighter oils will condense. The fixed gases continue through the condenser, and may be used for furnishing all or part of the fuel needed by the retort. The plant stands 42 ft. above and extends 8 ft. below the ground, and has a capacity of 50 tons daily, or about 50 bbl. of crude oil.

BUILD AND LAUNCH BIG SHIPS IN NEW DRY DOCK



After the Great Dry Dock was Flooded, the Vessels were Towed into the Harbor

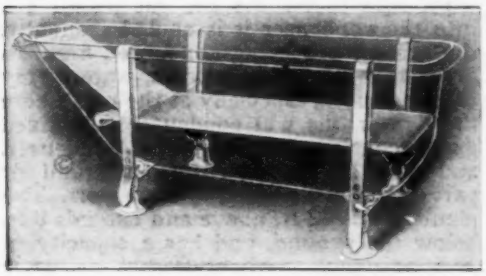
Two big ammunition ships and two target rafts, all built simultaneously in one of this country's largest dry docks, which was completed recently at the Puget Sound Navy Yard, were launched when the great structure was flooded and dedicated a short time ago by government officials. The basin is 950 ft. long, 130 ft. wide, and 30 ft. deep, and is the only dry dock on the western coast of sufficient size to accommodate the largest war craft in the Pacific fleet. Each one of the ammunition carriers, floated when the enormous tank was filled with water, has a displacement of 10,600 tons, and is 482 ft. 9 in. long, with 61-ft. beam, and 21-ft. draft. About three hours were required to flood the dock. When the latter was filled, the gates were opened, and the ships towed out into the harbor. Mineral water was used, instead of the customary wine, in the christening ceremony.



The Prow of One Ammunition Ship Extended Past the Stern of the Other in the Big Basin

HAMMOCK HANGS IN BATHTUB FOR HOSPITAL PATIENTS

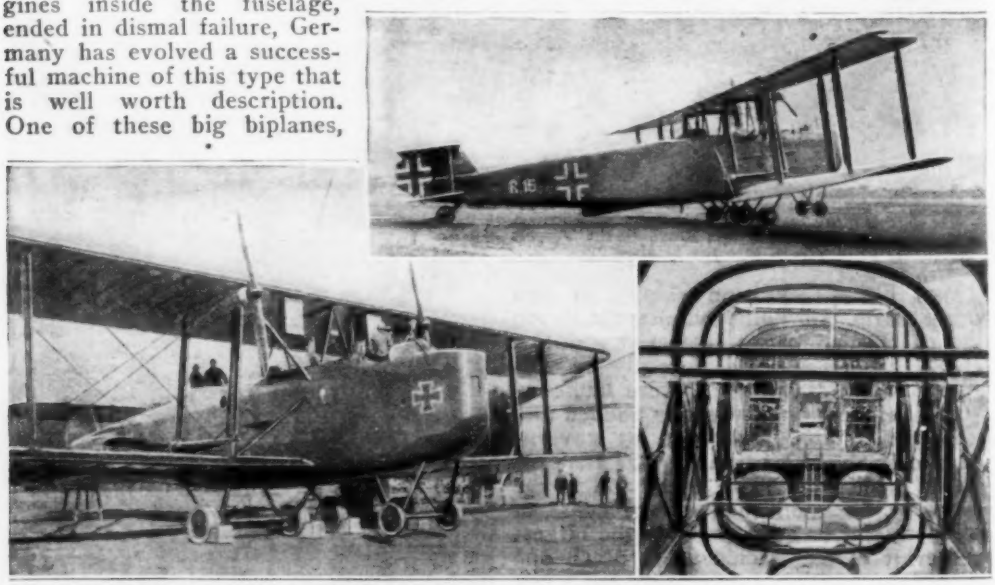
A hammocklike couch that hangs in a bathtub, a few inches from the bottom, supported by straps over the edge, is the latest appliance for increasing the comfort of hospital patients. The raised head portion, of rubber, allows the water to flow from the tap over the occupant's shoulder, while his forehead is kept cool with a compress. With these contrivances, army-hospital patients are kept in flowing baths for hours at a time.



Prolonged Immersion is Made Less of a Trial for the Patient When the Hospital Uses This Bathtub Hammock. The Straps are Made Fast to the Legs of the Tub, Seen Here in Outline

PLANE CARRIES FOUR ENGINES IN CENTRAL CABIN

Though America's one attempt to produce a multimotored airplane, with engines inside the fuselage, ended in dismal failure, Germany has evolved a successful machine of this type that is well worth description. One of these big biplanes, typical of the rest, and now being remodeled for the passenger trade, measures 115 ft. in span, and is driven by four propellers. Two of these are tractors and are mounted just below the upper wing; the others are pushers and are mounted just above the lower wings. Each is turned, through bevel gears and inclined shafts, by a 260-hp. engine placed in the engine compartment of the roomy fuselage. Here the engines are arranged in pairs, one above the other, on either side of a central passageway. In the commercial machine, this passageway connects the forward cabin, seating 12, with a rear cabin of the same capacity.

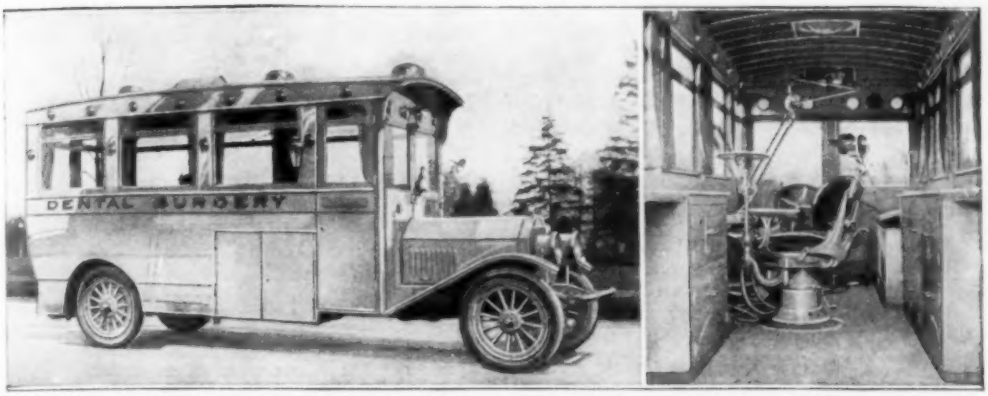


Above, Side and Three-Quarter Views of the Big German Bombing Plane Now being Made Over for the Passenger Trade: It Has Four Propellers, Each Turned, through Bevel Gears and an Inclosed Shaft, by One of the Engines Seen in the Background at the Lower Right

MOTORIZED DENTAL SURGERY SERVES FOREST CAMPS

That he might carry his services to logging camps, mill, and mining towns, and remote sections of the Pacific Northwest, a prominent dental surgeon has had built, on a strong motor-car chassis, a complete dental operating room. From the latest-model sanitary dental chair to the most delicate drill, filed away in the cabinets, the equipment is complete, and enables persons living in primitive places to obtain the same service as city dwellers.

The body is mounted on a specially strengthened chassis, with a powerful motor. Below the floor, in hidden compartments, are generator and storage bat-



Everything Required by the Up-to-Date Dental Surgeon is Included in the Equipment of the Truck Pictured on the Left. An Interior View of the Body, at the Right, Shows the Arrangement of the Numerous Modern Devices

teries for driving the equipment motors and water and air pumps. The large water, oil, and fuel tanks, and other special features, were designed by the owner.

In the body proper is everything to delight the heart of a dental specialist. In cold weather the compartment is heated by small stoves, and in the summer cooled by electric fans. Electricity cares for the pumping of water, and the vibration of the heavy propelling motor is eliminated by the use of smaller electric motors for every purpose inside the "office." Even the water for sterilizing instruments is treated by electricity. Into the tops of the low cabinets have been built sinks equipped with running water, faucets, and drains. A small skylight in the top adds to the effectiveness of the large windows.

ELECTRIC CURRENT OPERATES NOVEL GAS METER

Electric current is employed to operate an unusual gas meter now being manufactured in Europe for use where large quantities of gas are consumed, instead of the common type, which must be of great size to serve in such cases. The contrivance includes a short tube, in which are inclosed a heating coil, located near the center, and two temperature-measuring coils, one at each end. The temperature-measuring coils are designed to indicate the intake and outlet temperatures of gas passing through the tube, while the heat-producing element is intended to keep constant the difference between these temperatures. A watt-meter, by showing the amount of power used by the heating coil, indicates the quantity of gas that has passed through the device.

GASOLINE-VENDING MACHINES OPERATED BY COINS

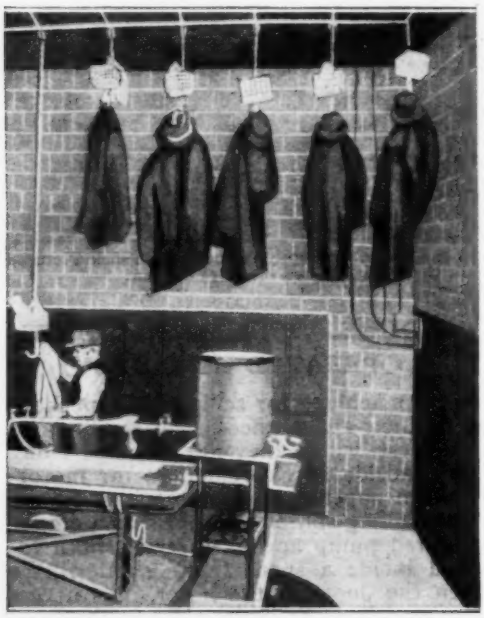
Slot machines for selling gasoline have made their appearance in certain parts of the West, where they are installed along the roadside as conveniences for motorists. In appearance they are like the ordinary filling stations, comprising a crank-operated pump and a reservoir, both located inside a small frame shelter. To open the doors of the latter, it is necessary to deposit coins in a slot in the lock.

Coin-Operated Filling Station: One Gallon of Gasoline can be Pumped Out of the Reservoir After Money has been Deposited in a Slot

Swinging the doors outward releases the pump crank, making it possible to transfer 1 gal. of gasoline into an automobile tank. Closing the doors locks the mechanism. If more gasoline is wanted, the operation has to be repeated.

CLOTHES HELD NEAR CEILING BY INGENIOUS HANGER

Perspiration-soaked garments doffed by miners or factory employes at the conclusion of a day's work are suspended



Clothes Hanger for Industrial Plants and Mines: The Contrivance is Designed to Replace Insanitary Washroom Lockers

near the ceiling, where they dry quickly, on a novel clothes hanger, recently placed on the market as a substitute for washroom lockers. The device consists of a four-pronged hook and a wire basket, both attached to one end of a small chain, which runs on an overhead pulley. A padlock is provided for fastening the opposite end of the chain to a wall cleat, when the hook and basket are in an elevated position.

SAGEBRUSH REINFORCES BANKS OF IRRIGATION CANAL

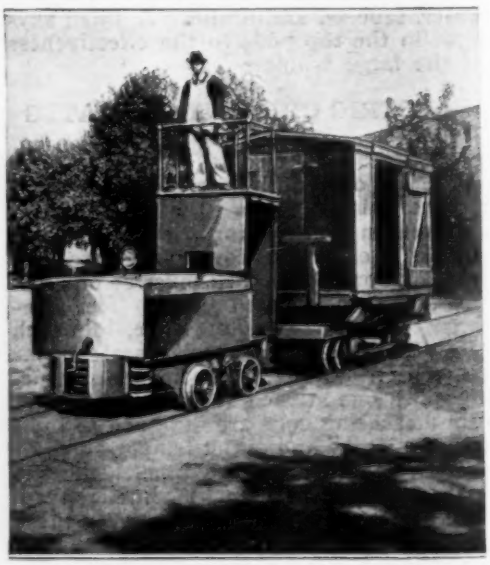
Utilizing a material commonly considered useless, an irrigating company that operates in the vicinity of Twin Falls, Idaho, reinforced the banks of the elevated canals under its control at a very low cost. Large quantities of sagebrush, which abounds in the region, were gathered and piled along the sides of the streams. Over this accumulation was stretched heavy woven wire to prevent the plants from being carried away by the water. The mattresses formed in this manner greatly strengthened the banks, and floods, caused by washouts, have not occurred since their construction.

ELECTRIC POWER BY THE YEAR FEATURE OF NEW TOWN SITE

Electric power is to be sold by the year, at a nominal figure per horsepower, to industrial plants that locate at a new town site in Oregon. As an additional inducement, ground space for factories is to be rented at one dollar a year. This enterprise is made possible by the recent completion of a 40,000-hp. hydroelectric plant on the Columbia River, which will later be developed to 120,000 hp. or more. The markets available to the region, its excellent transportation facilities, and its attractive climate, are expected to draw many business interests from other parts of the country.

MIDGET LOCOMOTIVE OPERATED FROM HIGH PLATFORM

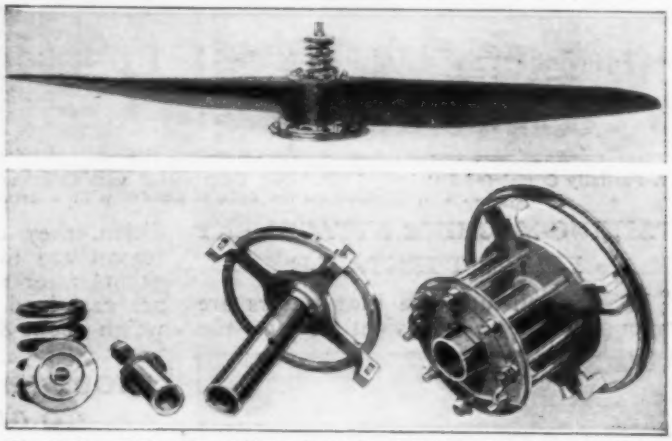
The gasoline locomotive that hauls freight cars between an eastern factory and the railroad station, two miles away, is so small and squat that the operator has found it impossible, hitherto, to see the track ahead when pushing a car. A platform with duplicate controls, therefore, has been built on the roof of his cabin. Standing here he has a clear view over the top of the average box car.



It was Found Necessary to Add an Elevated Platform to this Diminutive Locomotive, So That the Operator's Field of View would be Unobstructed

SLIDING PROPELLER MOUNTING MEASURES THRUST IN FLIGHT

For measuring and recording the thrust, or pull, of an airplane propeller under actual flight conditions, the U. S. Army Air Service has contrived an instrument which it calls the thrust meter. Roughly, the mechanism consists of a slidable propeller mounting which, while turned by a positive connection with the engine shaft, is yet free to move to a limited extent along the shaft, against the pressure of a powerful coil spring. Thus, as the engine speeds up and propeller thrust increases, the propeller moves away from the engine. To record this slight longitudinal motion, a roller plunger is kept, by a small spring, in constant contact with the rear face of the propeller hub. Moving back and forth, in this way, with the propeller, the plunger actuates a pencil which presses against a clockwork-driven drum, and so records the varying thrust at every moment of the flight. To make this record intelligible, a second, electrically operated pencil is provided, by which the observer can make a mark each time he notes altitude, engine speed, etc. Drum chart and notebook are later compared in the laboratory.

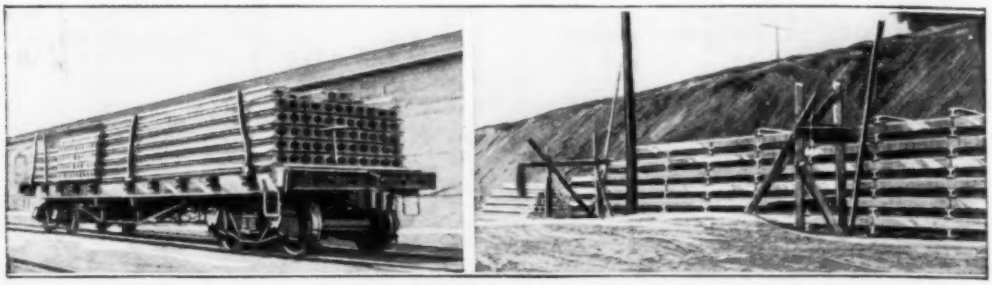


The Action of the Thrust Meter is Understood from the Side View of the Propeller, Above. Below, the Parts Which Carry the Propeller

CANNING-CLUB LEADER USES REMARKABLY EQUIPPED CAR

An unusually successful and popular leader of a canning club, and other organizations of similar nature, in a sparsely settled district of Colorado, owes much of her proficiency to the ingenious outfitting of her light auto. The demonstrating supplies are carried in a cupboard on the left running board, and the door on that side, with an adjustable ground leg, is quickly transformed into a table. The canning kit, in a special case, is roped to the opposite side of the car, and one of the front fenders supports a sheet-iron stove that will burn any fuel, the other side being reserved for personal luggage. Along the left side of the top is rolled a 12-ft. canvas awning, its poles hung at the opposite side. The front seat has been arranged to be let down and form the emergency bed, the bedding for which is carried under the rear seat in a waterproof cover. There still is room in the tonneau for other members of the demonstration team, or for a lantern fit for giving screen lectures. With this very complete arrangement, more than 50 car demonstrations were made in one season, and over 100 indoors. The little car averaged about 1,000 miles a month while in use for this helpful work.

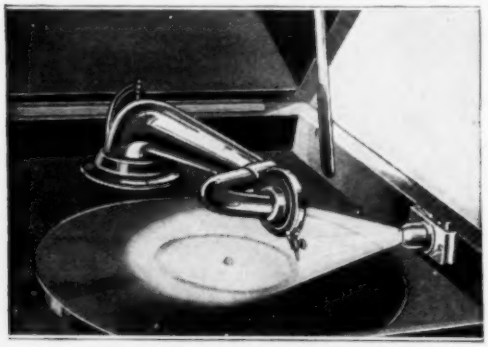
The Automobile in Which the Demonstrator Makes Her Rounds Is at Once a Comfortable Home and a Convenient Kitchen-Laboratory, with Table, Sheet-Iron Stove, Canning Paraphernalia, and Wide Canvas Awning



A Partially Completed Retaining Wall, being Constructed with Concrete I-Beams, is Shown at the Right. The Flat Car, Pictured on the Left, is Loaded with Beams of Various Lengths

TALKING-MACHINE ATTACHMENT LIGHTS TURNTABLE

Phonograph-turntable illuminators are among the unusual devices now on the



A Beam of Light is Cast on the Record Turntable and the Reproducer of a Phonograph by This Ingenious Device

market. This modern contrivance consists of a small electric lamp, mounted on a base, in which are combined a socket, a reflector, and a switch. The accessory is intended to be attached to the inside of a talking-machine cabinet. Current is supplied by a three-cell dry battery.

CONSTRUCT RETAINING WALLS WITH CONCRETE I-BEAMS

Molded into interlocking I-beams, concrete was used in the construction of some unusual retaining walls on an eastern railroad right of way. Short lengths of this material are imbedded in the earth fill at regular intervals, with one end protruding in a horizontal position. On these rest longer pieces, laid parallel with the embankment. Each beam is provided with lugs, which serve to hold the members of the wall together. Structures of this description are far less costly than solid concrete walls, it is declared, as they require no expensive foundation. In addition, they are flexible, and for that reason are not damaged when settling occurs after their erection. The beams are cast in 6, 9, and 12-ft. lengths, and weigh about 30 lb. to the foot.

SHOOT SHELL THROUGH COIL TO GAUGE VELOCITY

The odd idea of causing a projectile fired from a gun to act as the armature of an electrical generator, for the purpose of measuring the velocity of the projectile, is engaging the attention of the U. S. Bureau of Standards. The shell is fired through a coil of wire, and the magnetic disturbances set up by its rapid flight generate currents in the coil, which may be recorded and measured. The effects produced are rather complex, and will require considerable study before they are reduced to practical application.

FIREMAN MAKES NONSKID CHAINS FOR HIS BOOTS

Nonskid chains for rubber boots, shown in the illustration, are the useful and unusual products of a New York fireman's leisure hours. The spiked plate, held in the center of each sole by chain and strap, would be an annoying impediment to the ordinary pedestrian. The fire fighter, however, is often forced to work in veritable grottoes of ice, formed by congealing water from his hose. The chains are very easily slipped on and off.

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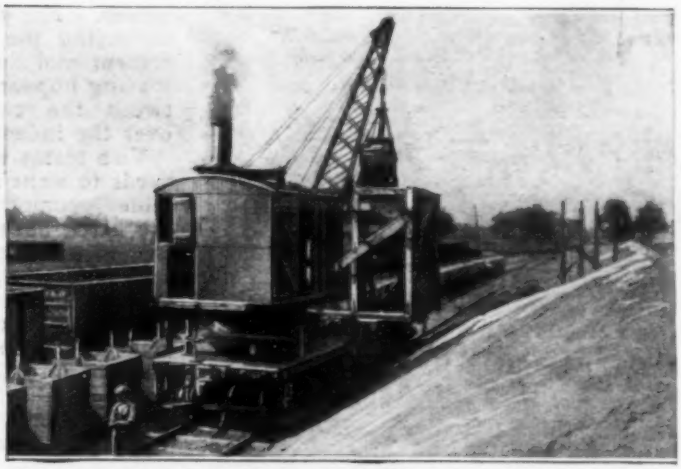
CONCRETE-ROAD JOB HANDLED ON BIG SCALE

By ALLEN P. CHILD

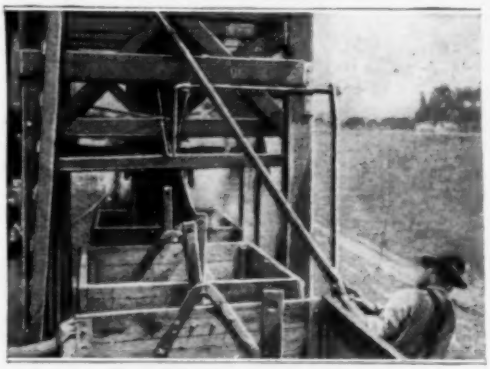
THE contractor for a stretch of state highway in Michigan recently organized some special and highly efficient equipment for his work. The outfit allowed him to build roads by the mile instead of by the foot, its capacity being from 800 to 1,000 ft. of concrete road every workable day, so that every week saw at least a mile of highway completed.

In designing the mechanical plant, the first requirement was a mixer with at least twice the capacity of any paving mixer in use. Then came the surrounding of this unit with the proper hauling and handling equipment to keep the mixer supplied with materials.

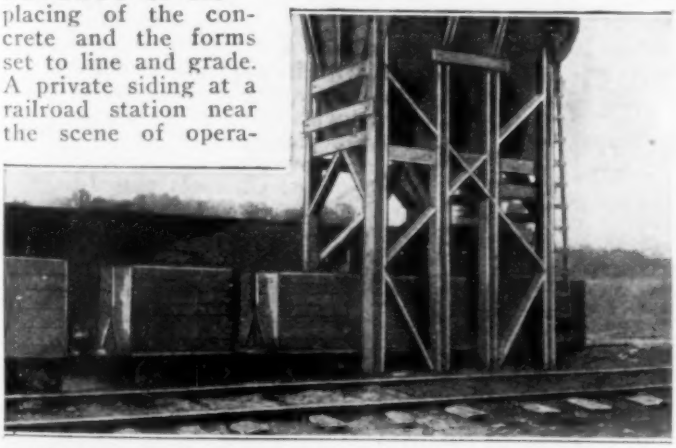
The paving of the road involved the construction of a 16-ft. pavement, 6 in. thick at the sides and 8 in. at the center, and with expansion joints of ¼-in. bituminous filler every 50 ft. The subgrade was prepared well in advance of the placing of the concrete and the forms set to line and grade. A private siding at a railroad station near the scene of operations was maintained by the contractor, and here all materials were received. The cars were unloaded by the use of a home-made locomotive crane which consisted of a shovel with boom and clamshell attachment, from which a ¾-yd. bucket was operated. This unloading equipment was mounted on a flat car. Chains connected the axle of the shovel with that of the car to furnish power for moving the machine when required. In the yard were laid two tracks, 400 ft. long, on one of which the cars of material were placed, while the sand and stone hoppers, on railroad cars, occupied the other track, with the crane operating between them. It proved very advantageous to place the storage bins on flat cars so that they could be moved with the locomotive crane to points where the aggregate was unloaded. A



This Crane at the Central Proportioning Plant was Bolted to a Flat Car, and Made Self-Propulsive by Means of Chains from the Hoist Drum to the Car Axle



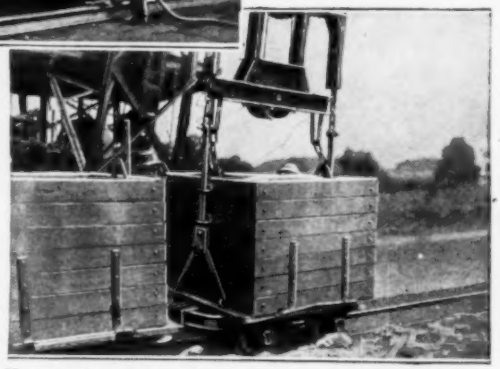
Cement from the Hopper was Dumped into the Cars in Accurately Measured Quantities by a Pull, First on the Larger Lever, Then on the Smaller



The Big Cement Hopper, Seen in the Central Photograph, is Here Pictured from the Side, with a Train of Cars About to be Filled

The Mixer Crane has Here Picked Up the Self-Dumping Box from One of the Little Industrial Cars

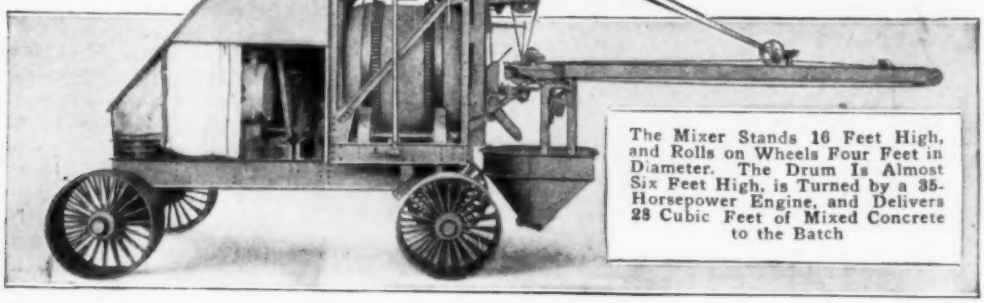
2-ft. industrial railroad connected the unloading yard with the mixer and its track ran between the standard-gauge tracks. A stock pile paralleled the latter, and if not unloaded into the industrial cars, the material was piled so that there would always be sufficient stock on hand in case of delays in receipt of materials. Cement was delivered by the railroad in open gondola cars covered with a tarpaulin. The clamshell bucket used for unloading the aggregate picked up the cement and dumped it into the cement-loading hopper, which was stationary between the two standard-gauge tracks over the industrial cars.



Here is Seen One of the Self-Dumping Material Boxes, and the Steel Bridle of the Mixer Crane

Two teams were used at the unloading yards to switch the industrial cars. Gasoline locomotives pulled the cars with the batch boxes to the mixer. Each car carried one batch box with a capacity of approximately 55 cu. ft. When the locomotives double-headed, the boxes were handled in 15-car trains. At the loading plant the proper quantity of stone was first put into the boxes, then the cement was measured by being passed through a cylinder holding 5 cu. ft. A 12-in. sheet-metal pipe, placed at the mouth of the hopper when cement was to be discharged, had gates at the top and bottom, which were opened and closed alternately to allow the cylinder to fill and dump its content, until the necessary amount of cement had been added to the stone in the batch box. A piece of canvas attached to the bottom of the cylindrical chute and to a hoop at the other end, which could be lowered into a car or raised in order to let it pass, prevented loss of cement by wind. The car was then shunted to the sand hopper, where the proper amount of sand was drawn from the gravity chute, with its single-lever control.

At the mixer, the boxes, which were fitted with two bottom dump doors, were picked up by a two-drum power crane. A steel bridle, of channels and I-beams,



The Mixer Stands 16 Feet High, and Rolls on Wheels Four Feet in Diameter. The Drum Is Almost Six Feet High, is Turned by a 35-Horsepower Engine, and Delivers 28 Cubic Feet of Mixed Concrete to the Batch

made it possible to pick up the boxes by irons attached to the doors and swing them into place. A pull on a line attached to the side of the box then dumped the contents into the charging hopper of the mixer. This crane, which operated on caterpillars moving under its own power, furnished the traction for the mixer. By attaching the mixer rigidly to the crane, a constant distance between the two was maintained and the necessity of raising or lowering the boom eliminated.

Some idea of the size of the mixer may be had when it is said that the height of the machine was 16 ft. It was equipped with 4-ft. wheels, having a 20-in. tread. The drum was 5 ft. 8 in. in diameter, and 4 ft. 10 in. long. The height of discharge above the ground was 6 ft. It was rated at 28 cu. ft. of mixed concrete to the batch. A 35-hp. motor furnished the power for mixing the concrete. The aggregate alone in one of these batches weighed over two tons. The advantage of handling the material only once instead of dumping it into a charging skip and then elevating proved considerable.

BLIND GIRLS MAKE BOOKS FOR BLIND SOLDIERS

Queerly enough, one of the cheeriest places in Cincinnati is the "Clovernook Home for the Blind." The girls of the home have no time for reflection on their own misfortunes; they are too busy at present with the production of books for British and American soldiers blinded in the war. Every operation is performed in the home.

As the Text is Dictated by the Phonograph at the Right, the Blind Girl Operates the Embossing Machine, Whence Come the Matrices Seen in the Photograph Above. The Books are Made from Start to Finish in the Workrooms of the Home

Three of the Blind Girls are Here "Printing" the Pages of the Books Which were Presented to Hundreds of American and British Soldiers Blinded in the War. The Braille System is Used Throughout

Some of the blind girls operate the machines which impress the metal matrices; others, clamping these matrices to rollers, emboss the paper. A last group cuts the paper to size, and binds the pages into book form.

During the past holiday season, the blind girls concentrated on the printing of two jolly volumes by famous humorists. One copy of each went to every one of the 1,200 British veterans at St. Dunstan's, England. Another lot of 400 went to American soldiers at Baltimore. All the books were embossed according to what is known as the Braille system, with which the soldier blind are generally familiar.

TURKISH SHELL UNEARTHS OLD HEBREW MOSAIC PAVEMENT

During a battle in Palestine between British and Turkish forces, many months ago, the explosion of a Turkish shell laid bare a bit of ancient Hebrew mosaic pavement. This caught the eye of a British major, who photographed it, and eventually carried the picture home to England. Recently, he mailed it across the Channel to an eminent French orientalist, who, with his knowledge of old Syrian dialects, was able to translate every word of the inscription. Interest attaches in particular to the last words, "Be not backward in giving to this Holy Place." They have led the scholar to make the suggestion that excavation upon the site of the find might disclose an underground chamber of some long-forgotten Hebrew synagogue.

Buried for Centuries, This Mosaic Pavement was Exhumed by a Turkish Shell during the Last Campaign in Palestine. This Photograph, Taken by a British Major, has Now been Translated by a French Scholar. Traces of Symbolic Designs are Seen at Right and Left

CAPRIFIG ORCHARD INCREASES PRODUCTION OF FIGS

Domestic fig growers until recently were handicapped by their inability to obtain an adequate supply of caprifigs, a wild variety of the fruit, on which lives an insect that fertilizes the cultivated type, known as the Smyrna fig, thus rendering the latter edible. To meet this demand, the Bureau of Plant Industry leased a California caprifig orchard, and distributed the crop to owners of Smyrna fig trees in different parts of the country. By this means, the production of figs in the United States will soon be large enough to supply the entire nation.

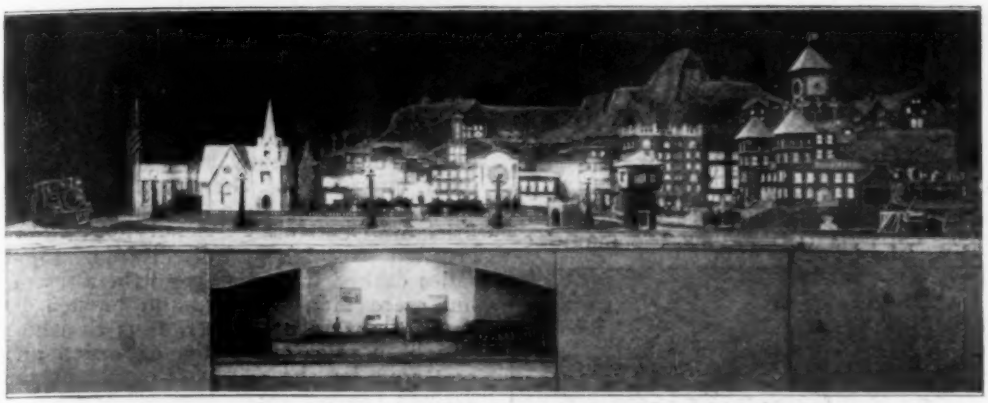
LARGEST OIL-CARRYING SHIP LAUNCHED IN ENGLAND

The largest oil-carrying steamer afloat, the "San Fernando," which was launched recently at an English shipyard, is notable because of its equipment, as well as for its size. Among the modern devices installed on the vessel are four powerful pumps, each capable of transferring 300 tons of oil an hour. With all of the pumps in operation, from 18 to 20 hours suffices to discharge a full cargo. The main hold is divided into 14 tanks. In addition to these, there are compartments, known as wing tanks, on either side. To facilitate the handling of heavy oils, the tanks are fitted with a complete system of heating pipes. The craft is 547 ft. long, has a beam of 69 ft., and a dead weight of 18,500 tons. Superheated steam is supplied to the ship's turbines, which are of the latest type, by five oil-burning cylindrical boilers.

RAILROAD'S NAME ON BRIDGES ASSISTS MOTORISTS

Automobile tourists often are guided to their destinations by following as closely as possible some railroad that approximately parallels the motor route. Recognizing this fact, an eastern railroad company has painted the name of the system on the side of every main-line bridge across a highway. The signs not only inform motorists, but also serve to advertise the railroad.

One of the Labeled Bridges on an Eastern Railroad: The Sign Imparts Valuable Information to Motorists Who Pass under the Structure



Electricity Operates the Utilities of This Miniature City Which Is an American-Made Toy. Stores of Various Descriptions, a Railroad Station, and a Theater Are Features of the Plaything

ELECTRICAL TOY REPRESENTS MODERN METROPOLIS

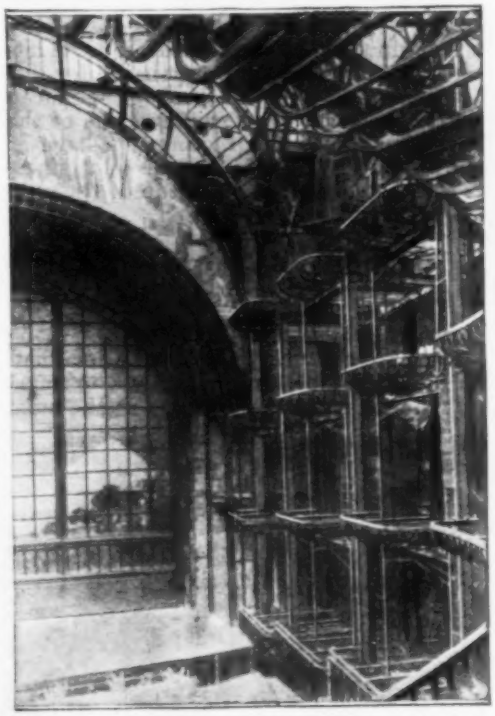
Realistically representing the business district of a large city, a toy manufactured by an eastern concern includes miniature railroad trains, a subway, several automobiles, a complete lighting system, an illuminated fountain, and other features, all operated by electricity, in addition to numerous buildings, among which are a passenger station, a church, and a theater. The elaborate plaything is 11 ft. 9 in. long, 11 ft. 4 in. wide, and 5 ft. high, and is controlled by means of a complicated switchboard, on which can be made more than 100 connections. A tiny hill serves as a background, while a canopy typifies the sky. Sunset and sunrise effects can be produced by a device provided for that purpose.

USE NATURAL FALL OF RIVER FOR POWER WITHOUT DAM

Taking power from the river without interfering in the slightest degree with its navigability is the project of engineers who have surveyed certain stretches of the Mississippi. The plan is to utilize the natural fall of the river, about 8 ft. to the mile, by constructing alongside of it a concrete canal with a drop of only one foot to the mile, and diverting water into it by means of a short wing dam. A canal five miles long would thus have a 5-ft. total drop, just enough to maintain flow, while the river drop in the same distance would be 40 ft. This would make available a head of 35 ft. from the canal to the river for the operation of a hydroelectric plant.

MEXICO'S NEW STEEL THEATER IS OF MOST MODERN TYPE

In many conditions of life, Old Mexico seems easily satisfied, but in the item of entertainment it demands the best. The most modern steel construction is ex-



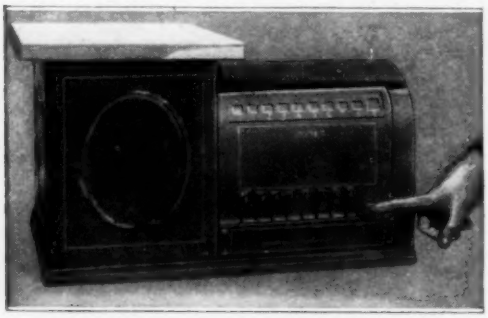
Modern and Well-Designed Steel Skeleton of a New Theater Now being Erected in Mexico City: Incidentally, Grace has Not been Sacrificed to Strength

emplified in a large theater now nearing completion in Mexico City, and examination of the skeleton of balconies and

boxes makes it clear that grace of design has been accomplished without any sacrifice of strength.

POSTAGE-COMPUTING MACHINE OPERATED BY KEYS

Much time and labor can be saved by using a new parcel-postage computing machine, it is declared by the manufacturers of the device, which is essentially a combined scale and indicator. The latter is operated by keys, numbered for different zones. When a package is placed on the weighing platform, and one of the keys depressed, the required postage is shown in figures that appear in a glass-covered aperture near the top of the contrivance.



Tedious Figuring to Compute Parcel-Postage is Rendered Unnecessary by This Device, Which is Operated by Keys, Numbered for Different Zones

FALLING WALLS AND PEPPER STORM MARK TRAGIC BLAZE

Fire-alarm box "Number 13," long known to the fire fighters of Cincinnati as the "hoodoo box," recently confirmed its reputation by calling them to the most disastrous local blaze in years. The fire originated in a great tea and spice warehouse, and was coming under control, despite the freezing weather, when the dusty contents of the building exploded, and rocked the structure. Firemen, laboring under a steel bridge that paralleled one side of the warehouse, were caught like rats in a trap as the high brick wall collapsed and fell. Four were crushed to death and 18 injured. Comrades dashed immediately to their rescue, but were met, blinded, and choked by dense showers of pepper, tons of which had been released by the explosion and scattered by the wind. Friends of the firemen suggest renumbering "Box 13."

DESTRUCTIVE FUNGUS SPREAD BY COMMON BUSHES

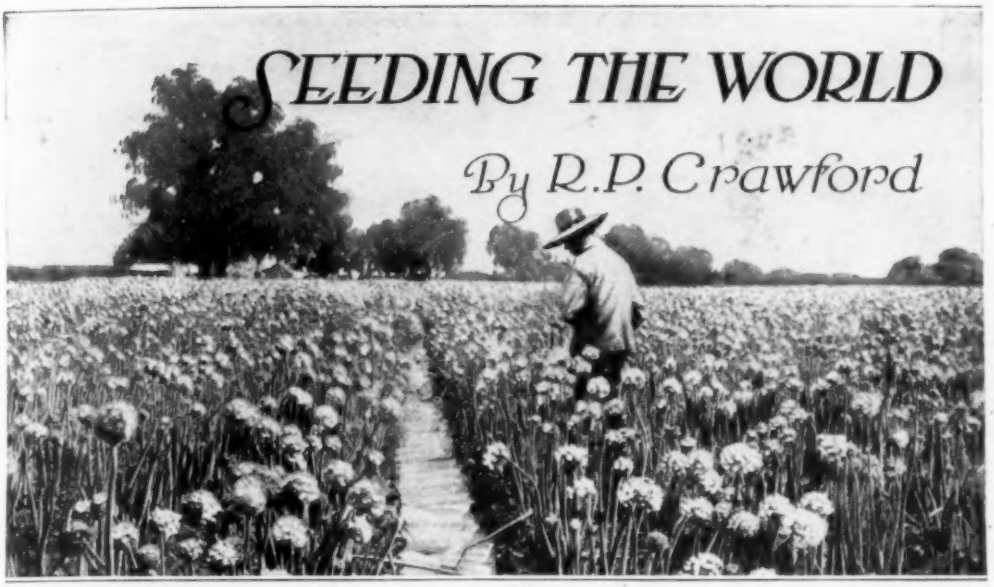
Blame for the spread of white-pine blister rust, a pernicious fungus, is placed on currant and gooseberry bushes by forestry experts, who recommend the destruction of all shrubs of these varieties in areas within 600 to 900 ft. of white-pine trees. Investigation has disclosed the fact that the spores of the parasitical plant develop rapidly on the bushes, from which they are transferred to uninfested trees by the wind. Fighting the pest in several eastern states last year, foresters rid 248,000 acres of white-pine forest land of the noxious fungus at an average cost of 54 cents an acre.

¶An American oil-burning freighter was submarined in the Panama Canal a few weeks ago, when it burst into flames that could not be subdued. The ship was towed to an outer harbor, and there sunk by 54 three-inch shells from the navy craft.

An Ice-Coated Wall of the Tea and Spice Warehouse is Seen at the Left. The Other Photographs Picture the Results of the Explosion, the Cross in the Middle Showing Where the Firemen Met Their Death

SEEDING THE WORLD

By R. P. Crawford

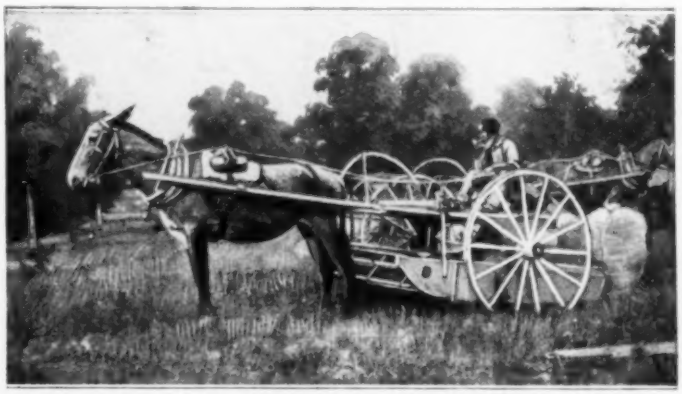


From This Extensive Field will be Harvested a Large Crop of Onion Seed. Before the War, Practically All the Bermuda-Onion Seed Planted in This Country, About 75,000 Pounds Annually, Came from the Canary Islands

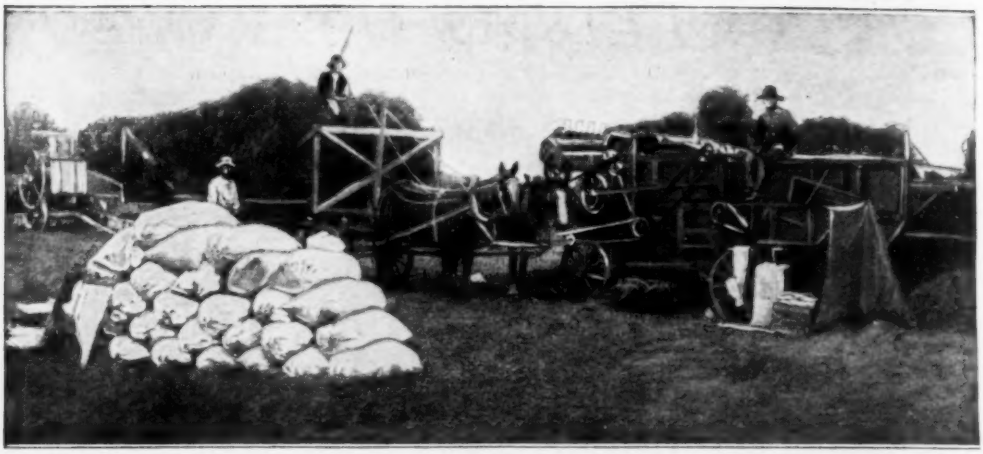
DID you ever stop to think what would happen if the entire seed supply of the world should be exhausted? There would simply be nothing from which to raise further crops, and the world would have to start all over again securing seed from and bringing wild plants into cultivation. Everyone has taken it as a matter of course to go to the corner store each spring, and buy his packet of vegetable seeds without for an instant thinking that there might not be enough to go round. Most of us would never think of saving seed from the plants we raise, and if everybody in the world thought the same, it would not take long for a world-wide shortage to develop.

The last few years probably have witnessed the nearest approach to anything of the kind in recent time, and, perhaps quite fortunately for the United States, it has resulted in extending greatly the seed-growing industry in this country. Probably most people do not even know where their seeds come from. Not only have the seeds for American gardens and farms been brought together from the four corners of America, but even from the four corners of the world. For instance, there have been large importations of alfalfa seed from Turkestan, despite the fact that it is inferior to seed produced here. Our radish seed before the war came largely from Germany, England, and France. About three-quarters of our supply of turnip seed came from the countries named above, and from Denmark, Holland, and Sweden. Denmark and Holland have supplied us with most of our cabbage seed. Spinach seed came from Holland, Italy, and France. Seed for Bermuda onions usually come from the Canary Islands.

Perhaps the most apprehension during the war was felt in regard to a supply of sugar-beet seed, and many of the big sugar companies arranged for the growing of crops of seed near their factories.



Bluegrass Stripper: In This Machine, a Revolving Brush Divests the Stalks of Their Seed-Filled Heads. Other Types Are Hand-Operated Devices, and Homemade Horse-Drawn Contrivances



Threshing Machines and Hullers are Employed in Preparing Clover Seed for the Market. One of the Former is Shown at Work in the Illustration. At the Present Time Clover Seed Is Extremely High in Price

Almost ever since sugar beets have been grown in this country we have been dependent on Europe for seed. Germany and Russia produced seed cheaper than it could be produced here. During the first few years of the war, seed was brought out of Europe by way of Siberia, or at least until the United States could get on its feet in the matter of producing it. Even now the Department of Agriculture is warning of a possible shortage of beet seed in 1921. It is believed there is plenty in this country for the 1920 crop. However, there will be little or none available from Europe. This is because those countries will try to enlarge their crop area as much as possible and will probably use up all available supplies. The same thing might apply to other seeds as well, at least to some extent. In order to produce sugar-beet seed in this country, it is necessary to select the beet roots in the fall, keep them from freezing over winter, and set them out as early as possible in the spring. To show that this country is making considerable progress, the fact may be cited that in 1919 nearly 10,000 acres were planted to beet roots for seed. It takes about 2,000 bags of seed, however, to plant enough beets to keep one of the factories in this country running.

Scene in a Sorghum Field, Showing a Harvester in Operation: The Seed is Later Removed from the Stalks Gathered in This Manner

Some idea of the enormous quantities of seed of all sorts consumed in this country may be gained from the fact that, according to the Department of Agriculture, it takes around 70,000,000 bu. of seed wheat to plant the country's crop; nearly 100,000,000 bu. of oats; 20,000,000 bu. of corn, and even 1,000,000 bu. of buckwheat for seed. Of course the supplies of grain for seed are often taken care of by farmers, or dealers in their respective communities. To take care of the production of Bermuda onions requires about 75,000 lb. of seed each year. Even the peanut crop requires between one and a half and two million bushels of shelled peanuts for seed.

As early as 1916, many European nations began placing orders for seed in the United States, and thereafter things began to pick up rapidly. Imports in most lines dropped off early in the war. Radish seed fell from

an average of 491,097 lb. before the war to only 102,735 lb. in 1918. Mushroom spawn dropped from 279,064 to 16,923 lb. Carrot seed in the same time fell from 149,724 to 32,500 lb., and alfalfa seed from 7,301,712 to 87,244 lb. A few seeds, due to special conditions, showed increases in imports. But for the year ended July 1, 1919, the United States had progressed so far that it had supplies in many lines sufficient to quadruple any exports that it had made in the past.

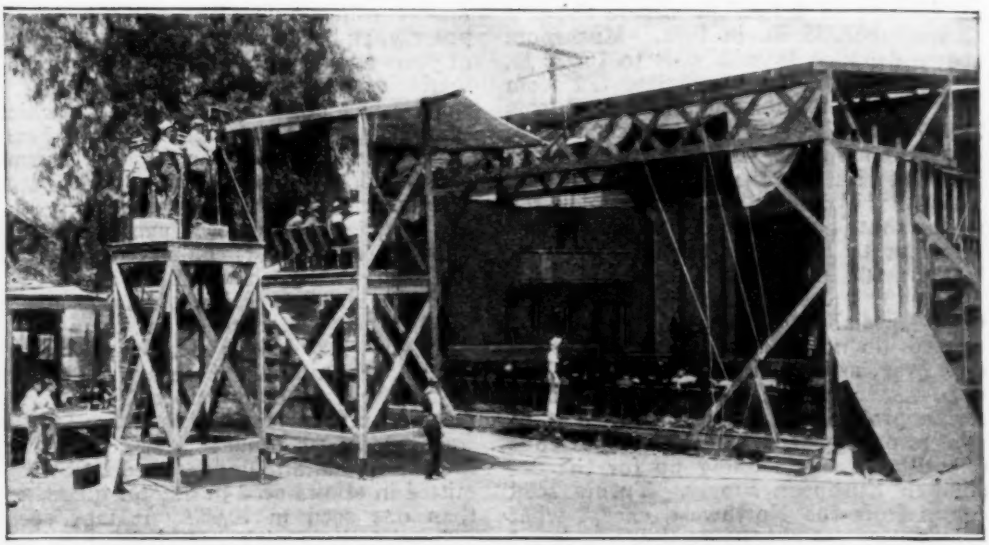
For the most part seed growing is a very specialized business, and most farmers do not save a few seeds for the next year, as did our forefathers. When it comes to raising vegetable seed, California probably takes the prize. Radish seed is now produced there in enormous quantities, easily making up for the decline in European supply. Turnip seed comes from the Northwest, except what is imported. Cabbage seed is produced in the Puget Sound country and on Long Island. Lettuce seed comes from California. Alfalfa seed is grown in favored localities over the western United States, mainly from Kansas, Nebraska, and the Dakotas westward. One might go on almost indefinitely naming the various sections of the United States that are noted for one or more kinds of seed. Thus, for instance, Toledo is generally regarded as the greatest red-clover seed market.

There is probably no other agricultural article whose sale has been connected with more humbug and fraud than seed. One may imagine the consternation of a farmer who would plant one thing, supposedly, and raise another. Only a couple of years ago farmers in new bean-growing sections were persuaded into buying a small Lima bean from the Orient which they planted in quantities. This bean, more commonly known as the Burma bean, had the unfortunate disadvantage of sometimes generating hydrocyanic acid in the digestive tracts of people who ate them. Weed seeds mixed with other seeds have been the bane of more than one farmer. Scores have had the alfalfa dodder pest established in their fields through a few dodder seeds mixed in the alfalfa. Fortunately there are state laws that make it an offense to sell seeds with more than a certain number of offensive weed seeds per thousand. For instance, in Nebraska alfalfa dodder seed is not permitted in alfalfa seed in greater quantities than one seed in 10,000. It may seem quite a task to pick out such seeds, but there are experts in every state who do nothing but count out such seeds with the aid of microscopes, having first separated most of them by various mechanical means.

Seed corn is usually grown in the communities where it is to be sown, since, with many crops, it is a decided advantage to have seed from plants which have been grown successfully there before. Many farmers have been known to pay a big premium for alfalfa seed which has withstood a severe winter, or season, in a particular community, when other plants have given out.

FLOCK OF TRACTORS MOVES ARMY HOSPITAL

THE strangest formation that ever crossed a parade ground was seen not long ago at Fort Bliss, Tex., when the wooden buildings of the base hospital were moved to a more convenient location. Over the level ground the smaller units were moved with ease. The largest structure, with base measuring well over 50 ft. square, was a harder proposition. It moved, however, though slowly enough, when nine army tractors were hitched in three tandem columns, to the frame of the building. The tractors, several of which had seen service in France, were of the small, endless-tread type.



When the Scenario Calls for a Scene in a Theater Auditorium, the Motion-Picture Company Erects This Triple Framework. The Staging at the Left Supports the Cameras, the Next Serves as a Balcony, and the Larger Holds the "Stage"

GARAGE AIR-HOSE RACK MADE FROM OLD CRANKSHAFT

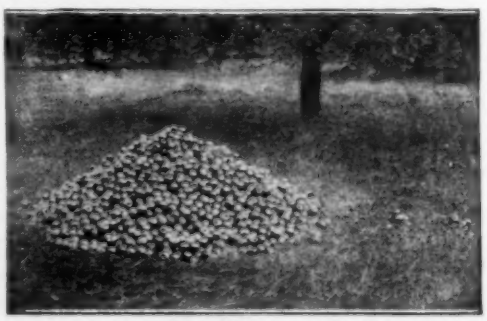
Before a public garage in a Pennsylvania town stands a peculiar rack, on which is draped the air hose for blowing up customers' tires. A crankshaft from an old four-cylinder engine, supported vertically, constitutes the frame, and the reel consists of two discarded steering wheels on a cross spindle. The easily recognized parts make the rack an advertisement, too.

SIMPLE SCAFFOLDING BECOMES "THEATER" FOR MOVIE STUDIO

A formula that explains most motion-picture effects, from the unnoticed to the astounding, is that "things are not what they seem." When the scenario calls for a theater scene, for example, one large producing company erects a conventional stage, and places a few theater chairs before it. A 20-ft. scaffold for the cameras is built, about a hundred feet from the stage. A second scaffold, a little lower than the first, is then put up between the cameras and the stage. Here are placed half a dozen chairs and a balcony rail. It is easy to see how the resulting picture gives the illusion of a crowded auditorium.

SPRAYING ELIMINATES WORMS FROM CROP OF APPLES

Properly sprayed apple trees will produce practically worm-free fruit. This was proved by an experiment conducted last year in the orchard of the Ohio Agricultural Experiment Station, at Wooster. Insecticide was applied to a tree soon after it blossomed, and again in midsummer. As a result, less than one per cent of the crop was attacked by worms. The mixture employed was prepared especially for the eradication of the destructive codling-moth larvæ.



Crop of a Sprayed Apple Tree: The Fruit in the Large Pile, at the Left, Is Free from Worms, While That in the Two Small Piles Is Wormy

WAREHOUSE COLLAPSE AVERTED BY UNUSUAL MEASURES

Decayed piling underneath an eight-story warehouse, located beside a river in a middle-western city, was on the verge of allowing the structure to topple into the stream recently, when uncommon measures were taken to prevent the threatened disaster. Danger was forecast by a well-defined crack, which appeared in the wall next to the water. Faceplates and anchor rods were installed to strengthen the unstable wall, after which the bricks at the bottom of the first-floor doorways were removed, exposing some of the piles and cross timbers supporting the storage house. The rotten piles, rendered accessible in this way, were cut off below the surface of the water, and on the remaining portion were constructed lumber cribs, which served to uphold long steel beams, laid parallel with the wall. Other beams of the same material were inserted in holes in the wall, at such a height that they rested on the parallel beams. The entire lower part of the wall was then removed, and for it was substituted one consisting of concrete and brick. Before the new foundation was built, the wall was alined by means of jacks.

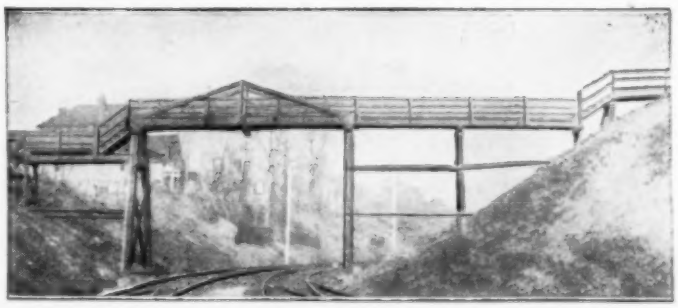
ARMLESS DUTCH ARTIST USES FEET TO PAINT PICTURES

Picture painting is among the accomplishments of an armless Hollander, who has trained his feet to perform practically every task ordinarily executed with the hands. Holding a brush between two of his toes, the handicapped artist works while seated before an easel. The dexterous-footed painter also shaves himself, using his feet to manipulate the various utensils required for the operation. He obtains a living through the sale of his pictures.

Skillful Feet Serve Instead of Hands for This Armless Dutch Artist, Who is Shown Here Sketching with a Stick of Charcoal. He Also Shaves Himself

TWO STAIRWAYS IN NOVEL RAILROAD FOOTBRIDGE

In crossing an odd wooden footbridge over a railroad cut in Cincinnati, Ohio, pedestrians climb or descend two flights of stairs. One side of the excavation is considerably higher than the other, and so it was necessary to build the approaches of the structure at different levels. To make this possible, steps were installed at either end of the main floor.



Three-Level Footbridge: Stairs were Placed in This Unusual Structure to Connect the Main Floor with the Approaches, One of Which Is Higher than the Other

This Old Sugar Mill at New Smyrna, on the Eastern Coast of Florida, Is a Relic of the Then Largest Colonization Project Ever Attempted in North America. The Colony's Admirably Engineered Irrigation System, Dug before the American Revolution, is Still to be Seen about the Modern Town; the Visitor's Interest is Usually Most Attracted, However, by the Ancient Landmark Pictured Above. The Walls and Machinery Beds Are of Coquina

FLORIDA SUGAR MILL NEARS 150TH BIRTHDAY

The Old Sugar Mill at New Smyrna, Fla., about 12 miles down the coast from Daytona, stands amid moss-hung trees, as a picturesque and legend-haunted relic of the ill-fated colonizing enterprise that in 1769 brought 1,500 Minorcans, Greeks, and Italians to this region, and for a few brief years thereafter transformed seven miles of vine-tangled swamp land, along the coast, into orderly little plantations where grew Indian corn, cotton, rice, indigo plants, and sugar cane. And it was probably for the crushing of this cane, a plant no longer grown in the vicinity, that the colonists built the old mill. The walls and machinery beds they made of coquina, a soft, whitish stone formed of broken shells and corals, cemented together by nature. The iron crushing machinery itself, probably erected at a later period to replace the colonists' cruder apparatus, is nevertheless remarkable for its century-long resistance to the fierce corrosion of the tropic damp, which quickly consumes unpainted ironwork. The ironmasters of those days seem to have been quite familiar with the so-called modern formulas for making rust-proof iron.

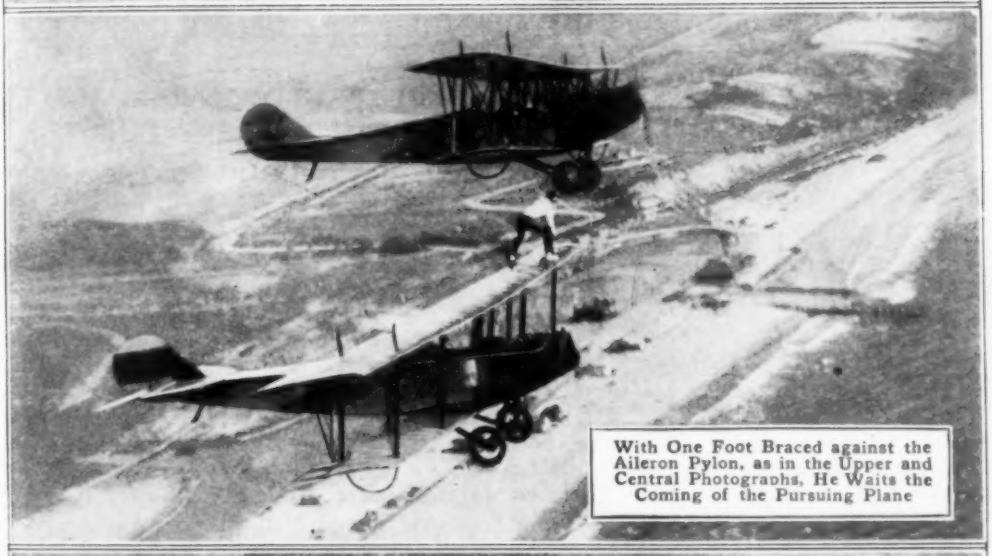
SIDE-WHEEL BOATS EMPLOYED FOR MINE SWEEPING

Thirty-two shallow-draft side-wheel steamers of special design were constructed for the British navy during the war, and used as mine sweepers, it became known recently. Vessels of this type were considered safer than trawlers for the work, cost less to build than screw-propelled craft, and required comparatively small crews. An ingenious device was employed to prevent the boats from heeling when pulling mine-sweeping wires, or running broadside to the wind. The contrivance includes two tanks, each capable of holding 10 tons of water, one fastened on either side of the ship near the paddle boxes. To counteract a list, it is necessary only to fill the tank on the side opposite the direction of inclination. The paddlers are 245 ft. 9 in. long; have a displacement of 810 tons, and draw 6 ft. 9 in. of water.

¶The first pygmy hippopotamus born in captivity, now only a few months old, is on exhibition in a New York City zoological garden, its birthplace. On its natal day, the animal weighed 5 lb. It is being raised by the bottle method.

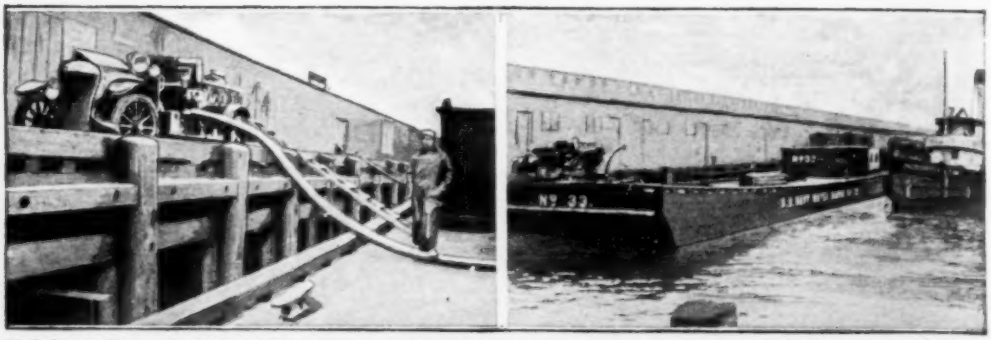
MID-AIR TRANSFER MADE WITHOUT ROPE LADDER

A Mid-Air Transfer Is Hazardous Even When a Rope Ladder is Used; but as Done by the Airman on the Wing Tip, Above, the Feat Takes On New Danger



With One Foot Braced against the Aileron Pylon, as in the Upper and Central Photographs, He Waits the Coming of the Pursuing Plane

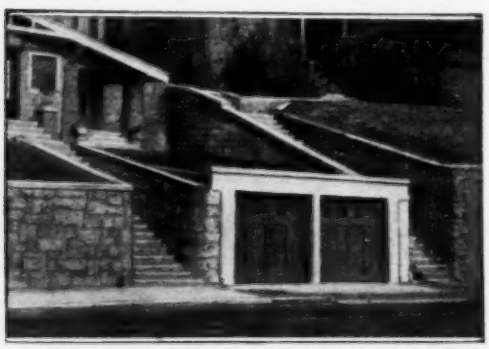
Just as the Planes Seem About to Crash, the Airman Grasps, Not a Dangling Rope Ladder, but the Wing and Strut of the Upper Plane. A Drop into an Air Pocket at This Instant would Mean Disaster to Both Planes



Fighting a Water Famine: At the Right can be Seen One of the Water Barges Used to Relieve the Situation at the Naval Training Station on Hampton Roads. Fire Engines Pumped Out the Water, as Shown on the Left

CAVE UNDER RESIDENCE LAWN SERVES AS GARAGE

Though located in front of a beautiful Los Angeles home, a private garage does not mar the appearance of the residence,



A Cave under the Front Yard of a Los Angeles Residence Serves as a Private Garage for Two Automobiles

as might be supposed. The explanation is simple. Instead of erecting a building on the terrace lawn, the owner of the property tunneled under it, forming a cave, in which two motor cars can be stored. Doors next to the sidewalk give access to the underground storage room.

BARGES TAKE WATER TO NAVAL STATION DURING FAMINE

During a long-continued drought last winter, the shallow lakes which serve as reservoirs for Norfolk, Va., were completely emptied, with the result that the municipality, as well as the large naval training station, located a short distance away on Hampton Roads, was confronted with a serious fresh-water famine. Unusual methods were employed in combating the situation, while drastic conservation rules were observed in both places. Water was brought to the city in tank cars, and distributed in small quantities for drinking and bathing purposes. At the government school, water barges were used to relieve the shortage. The craft were filled at various points, and towed to the station, where their contents were pumped into water mains by fire engines.

PLAN TWO LONG AERIAL RACES FOR CURRENT YEAR

Encouraged by last year's remarkable accomplishments, which included the initial crossing of oceans and continents by airplanes, airmen are planning further flying contests, and at least two aerial races of importance will be held during 1920, unless prevented by unforeseen events. The course selected for one is from New York to Alaska; for the other, across the southern border of the United States. The races will be held under the auspices of a well-known flying club.

HARBOR ISTHMUS SWEPT AWAY WHEN GRASS IS DESTROYED

Maritime engineers have long recognized the value of shore grasses as a means for preventing the sea from changing the formation of sandy coasts, and for stopping the movement of dunes. An example of what may result when such plants are destroyed may be seen at Port Hood, Nova Scotia, where formerly there was a fine harbor, protected by a narrow, grass-covered isthmus of sand. Cattle were allowed to graze on the strip, with the consequence that in time it was entirely denuded of vegetation. Without the anchoring grass roots, the sand became easy prey for the wind and waves, which soon swept away the isthmus, transforming the harbor into a worthless open roadstead.

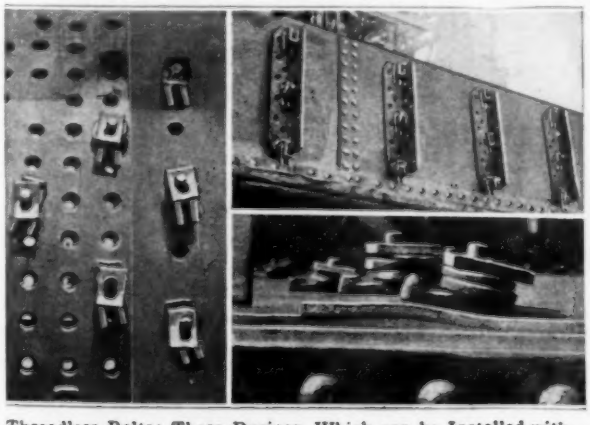
TOWN GETS COMMUNITY HOUSE AS MEMORIAL

With appropriate ceremony, there was dedicated, a few weeks ago, Pennsylvania's first community house. The place was Marietta, a little town of 3,000, in the southeastern part of the state; the donors were the mother, father, and brother of a young airman killed in the service of his country. The house, a thing of architectural refinement, is framed by tall pine trees, flanked by broad porches, and, within, is in perfect harmony with its intended use. A reception hall, two rooms for Red Cross work, a dining room, a kitchen, and a men's lavatory are found on the first floor. On the second, is the office of the "community secretary," a women's rest room, more workrooms, a sun parlor, quarters for the caretaker, and a well-stocked library. The third floor is equipped with pool and billiard tables.

This House was Given to the Town of Marietta, Pennsylvania, by a Local Family, in Memory of a Son Killed in the Service of His Country. The Home is Beautifully Equipped for Its New Service

THREADLESS BOLT FOR SHIPS HAS WEDGE INSTEAD OF NUT

For holding ship plates in place for riveting, a new kind of bolt, without nut or thread, has been found entirely satisfactory by a west-coast shipyard. The end of the bolt is grooved across to form a pair of shoulders, and when as many common washers as are needed have been strung on, a washer with a keyhole slot is slipped into the grooves. Then a wedge with an open slot is driven between the ship plate and the lower washer, and the whole tightened as firmly as would be possible with a screw. After the riveting, a few taps of the hammer remove the wedge, and the bolt is withdrawn, ready for another hole. The new bolt saves a great deal of time and expense.



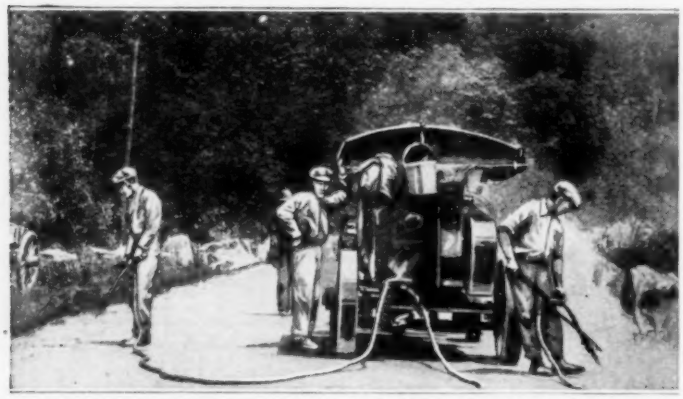
Threadless Bolts: These Devices, Which can be Installed without Nuts, are Used for Holding Ship Plate Together for Riveting

BARK OF EUCALYPTUS TREES YIELDS VALUABLE FIBER

Articles usually made from flax or jute, such as twine, rope, and bagging, are produced at a very low cost in a recently established Australian factory which utilizes a fiber obtained from the bark of certain eucalyptus trees. While complete information on the subject is not available, it has been revealed that a mechanical device is used for softening the bark and separating the fiber from the material in which it is imbedded. Special carding and spinning machines are employed to transform the product into thread. The supply of raw material which is declared to be inexhaustible, is obtained in the vicinity of the novel plant. Its collection requires only a small amount of labor.

COMPRESSED AIR CLEANS ROAD IN NEW YORK PARK

When the main drive in a public park, near West Point, N. Y., was resurfaced recently, a novel method was employed



Cleaning a Road with Compressed Air: Every Particle of Dust was Removed by This Method, Which was Employed After the Highway had been Carefully Swept with Wire Brooms

to clean the road, before the new coat was applied, in order to insure a good bond between the fresh and the old material. The highway was first swept with wire brooms. As these devices failed to remove all the dust, an air compressor, mounted on a horse-drawn conveyance and provided with two hose, was used to finish the task. With this apparatus, the remaining loose particles were blown from the thoroughfare. A gasoline engine furnished power to operate the compressor.

PACKINGLESS WATER FAUCET MANUFACTURED IN SWEDEN

Discouraging news for the plumber comes from Sweden, where a factory recently started the production of packingless water faucets. The troublesome material is rendered unnecessary by grinding the valve seats and faces so accurately that these parts fit closely enough to prevent leakage. At present, 200 faucets are being manufactured daily, but plans have been made for increasing the output to 100,000 annually, by enlarging the plant.

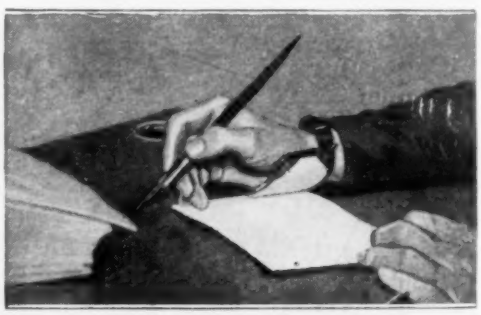
¶A stone statue of enormous size, one of the largest sculptures in the world, is to be erected by Americans on the banks of the Marne, near Meaux, France, in commemoration of the French victory of 1914. Its estimated cost of $250,000 will be met by popular subscription.

STEAMSHIP DRIFTS EIGHT DAYS ON FLOE IN LAKE MICHIGAN

Stranded on an enormous floe, the steamer "Sidney O. Neff" drifted about near the southwestern shore of Lake Michigan last winter for eight days before being released from the imprisoning ice. The vessel met misfortune during a voyage from Milwaukee to Chicago, when it encountered a vast field of floating ice about 11 miles from the latter city. Endeavoring to force its way through this obstacle, the ship became fast near the center of a frozen island, six miles square. Several futile attempts were made to rescue the boat with tugs. Twice airplanes went in search of the craft, on one occasion carrying food for the crew. Finally, the freighter "Alabama" succeeded in breaking a passage through the floe to the helpless vessel, which then proceeded to Chicago under its own power.

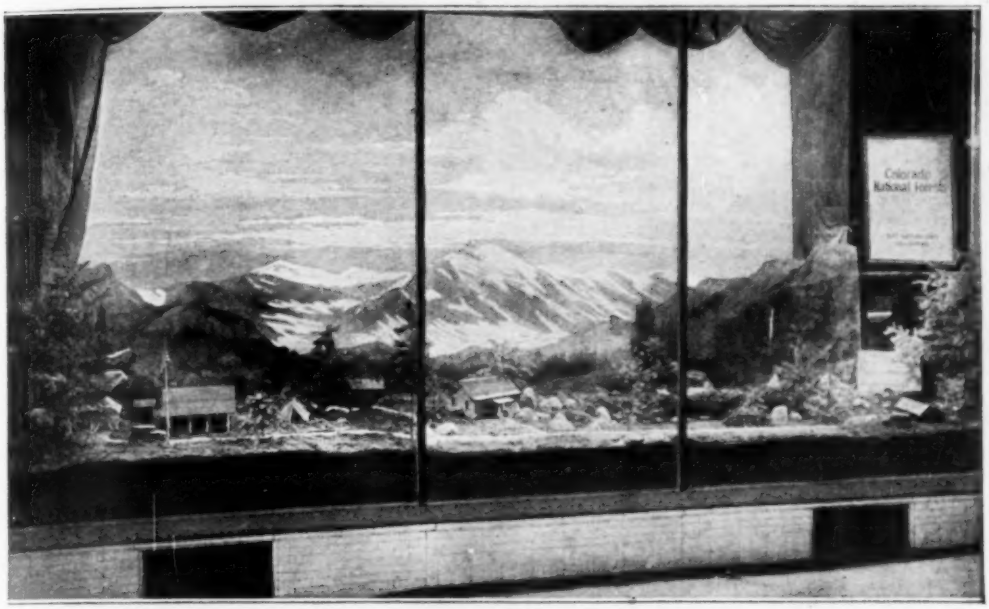
BLOTTER ATTACHED TO WRIST SAVES TIME OF WRITER

To save the time wasted by pen users in picking up and laying aside ordinary blotters, a western inventor has devised a means for attaching the absorbent paper to the wrist, where it is available for instant use, but does not interfere with the movement of the writer's hand. The



Blotting Paper is Held in a Convenient Position by This Simple Contrivance, Which is Designed to be Strapped to the Wrist

contrivance includes a curved leather holder, into which a small blotter can be fitted, and a strap for fastening the device in place.



One of the Window Displays Used by the Forest Service to Advertise the National Forests of Colorado: The Miniature Scene Includes a Lake, a Running Stream, Growing Trees, and Wild Animals

FOREST SCENE REPRESENTED BY WINDOW DISPLAY

Remarkably beautiful window displays are employed by the Denver branch of the United States Forest Service to advertise the national forests of Colorado and to point out to the public the advantages of these reservations as summer-camping grounds. Composition board, on which are painted snow-capped mountains, and a canvas curtain, representing a clouded sky, form the background of one of the exhibits. In front of these is arranged a miniature sylvan scene, which includes a tiny lake, stocked with small fish, a running stream, cabins, and tents. Besides these, there are diminutive growing trees and animals, the latter embracing deer, squirrels, and rabbits. A placard, bearing information regarding the forests, is also included in the display.

NEW DEVICE COOLS HOT BOXES WHILE TRAIN IS IN MOTION

Hot boxes no longer seriously delay trains on a western railroad, as was the case before the adoption of a novel bearing cooler, which operates while cars are in motion. A cylindrical 5-gal. tank and a length of hose, the latter connected to the former, are the principal parts of the contrivance, which is designed to be hung on the side of a car above an overheated journal box by chains, attached to the ends of the reservoir. When the device is installed in this position, the hose

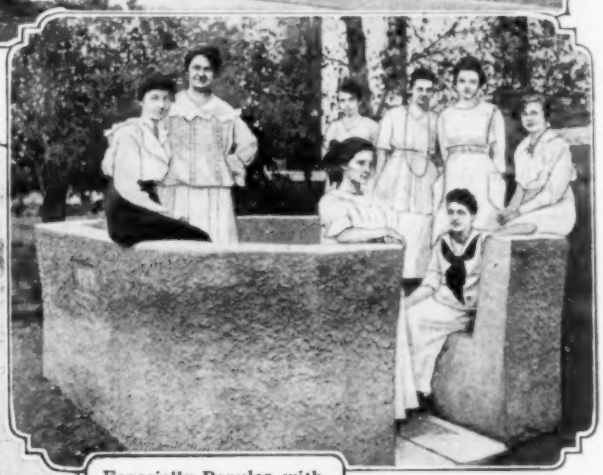
Bearing Cooler for Railroad Cars: Water is Conducted to a Hot Box by the Hose, Which is Connected to a Five-Gallon Reservoir

serves to convey water, which acts as a cooling agent, from the tank to the affected bearing.

¶A glass bottle stopper that incloses the neck like an inverted cup, and so keeps dust and other contamination from the lips of the medical flask, is the recent invention of a French physician.

CIVIC FEATURES THAT PROMOTE THE COMFORT

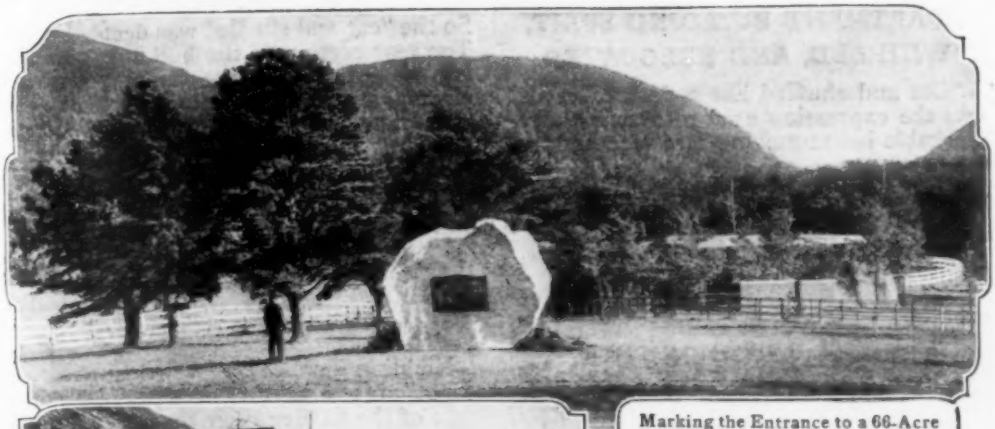
A Street-Corner Grape Arbor in Pasadena, California, Not Only Beautifies the Neighborhood, but Provides Its Owner with Fruit. The Vine is Trained on a Wire, Which is Supported About 10 Feet above the Ground



Especially Popular with Enamored Couples Is This Octagonal Concrete Seat, Known as "The Spoonholder," Located on the Campus of a College at Stillwater, Oklahoma

On That Momentous Night in April, 1775, When Paul Revere Dashed into Lexington, Massachusetts, Heralding the Approach of British Troops, the Bell in This Belfry Aroused the Villagers. The Structure Now Stands on the Town Common

When a Conflagration Starts on the Wharves at San Pedro, California, the Contents of Several Hundred Conveniently Located Hose Boxes Are Ready for Fighting the Flames, Pending the Arrival of the Fire Department

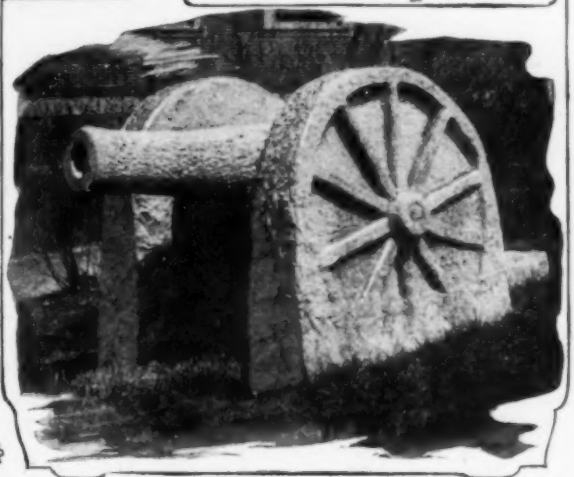


Marking the Entrance to a 66-Acre Public Park, Recently Dedicated at Bar Harbor, Maine, Is a Huge Bowlder, Weighing More Than 50 Tons. It Bears a Suitably Inscribed Tablet

Ascending the Face of a Precipitous Bluff in Pittsburgh, Pennsylvania, Is a Remarkable Concrete Stairway, 400 Feet Long, and Comprising 215 Steps in 13 Flights

Carefully Selected Rocks, Gathered in the Desert near Twin Falls, Idaho, were Used in Constructing This Attractive Rustic Drinking Fountain in a Public Park of That City

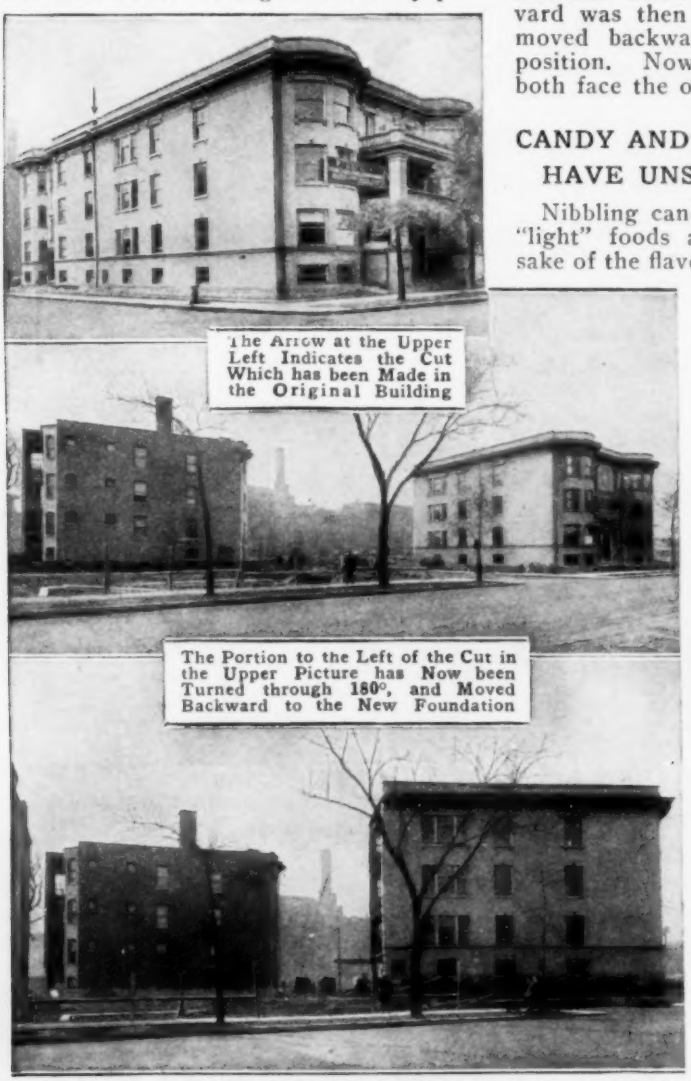
Vehicle Drivers in Chattanooga, Tennessee, Have No Excuse for Collisions Since the City Authorities Installed 12-Foot Figures, Representing Traffic Policemen, at Busy Street Intersections



Carved from a Huge Block of Granite, This Unusual Monument Marks the Spot in Lexington, Massachusetts, Where, during the Revolutionary War, a British Commander, Attempting to Save His Troops from Utter Defeat, Fired on the American Patriots with a Fieldpiece

APARTMENT BUILDING SPLIT, WHIRLED, AND RELOCATED

"Cut and shuffled like a deck of cards" was the expression used to describe a remarkable house-moving feat recently performed in the city of Chicago. The house was an L-shaped, three-and-a-half story apartment building, with one entrance on a boulevard and one on a side street. The site requisitioned some months ago by the Board of Education, the owner found that the corner lot across the side street was the only possible site for relocation. And this lot was too short by some 50 ft. So the "cut and shuffle" was decided upon. The rear section of the building, containing six of the 12 apartments, was cut cleanly away, turned through 180°, and then rolled across the street to the new location. The section facing on the boulevard was then turned through 90°, and moved backward, similarly, to its new position. Now the two new buildings both face the old location.


The Arrow at the Upper Left Indicates the Cut Which has been Made in the Original Building
The Portion to the Left of the Cut in the Upper Picture has Now been Turned through 180°, and Moved Backward to the New Foundation

As the Last Step in the Complicated House-Moving Operation, the Portion to the Right of the Arrow in the Uppermost Picture was Turned through 90°, and Then Moved Backward to Its New Position

CANDY AND INCIDENTAL FOODS HAVE UNSUSPECTED POWER

Nibbling candies and other supposedly "light" foods at odd moments, for the sake of the flavor rather than for nourishment, is a common habit, and one that appears to be on the increase. Recent scientific study reveals the fact that these incidental indulgences, regarded in so casual a way, really contribute astonishingly to the total food energy of the consumer's diet. The eating of less than half a doughnut, for example, supplies something like 80 calories, or units of heat energy, enough to replace that used up by the average man in climbing the Washington Monument. Four pretzels, five large olives, or six walnuts, would serve as effective substitutes for the half doughnut. Three regular meals a day supply 2,000 to 3,000 calories, but a one-cent portion of candy may contribute 50 or more, and ice cream with trimmings may yield as high as 500 calories. The energy used in walking a mile may be replaced by eating one caramel. It is evident that a considerable stroll would be needed to dissipate the effects of some candy revels.

¶ Due to the lack of soap, the population of Russia is declared to be infested with lice, which are instrumental in spreading typhus and other diseases. A poor substitute for soap, made from clay, is now used in the turbulent country.

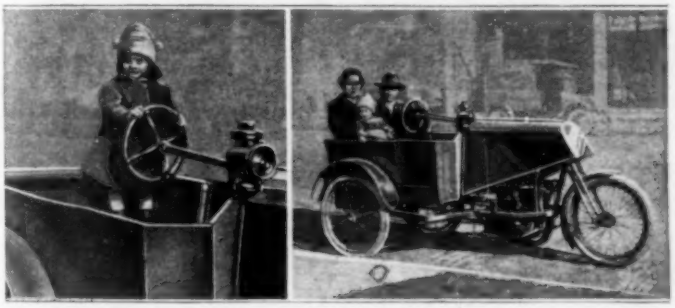
SINGLE HUSKY PULLS SKI-MOUNTED ALASKANS

Eskimo dogs render invaluable service to the population of Alaska. Without the sturdy animals, winter travel would be almost impossible in the northern territory. Harnessed to low sleds, husky teams make long journeys to otherwise inaccessible points. A newer and less generally known method of utilizing the furry beasts involves the use of skis. The wooden runners are strapped to the feet of a person, and a single canine, hitched to a belt around the waist of the traveler by means of a 10-ft. rope, furnishes the motive power. Exceedingly swift trips are made in this way over snow-covered routes.

Ready for a Ski Trip: The Dog is Hitched to a Belt around the Waist of the Man with a 10-Foot Rope. Swiftness Characterizes Journeys Made in This Manner

SIMPLE BODY MAKES ROADSTER OUT OF MOTORCYCLE

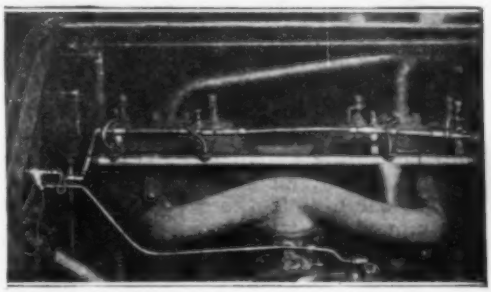
Though motorcyclists may affect disdain toward such luxuries as upholstered chair seats and wheel steer, many of them are glad to enter the regular auto class when opportunity offers. A Chicagoan has made the shift easy by designing a simple body which, attached by a few bolts to a motorcycle and sidecar frame, literally changes it to a good roadster. The applied body has a comfortable two-passenger seat, a dash with spark and gas connections, conventional pedals for clutch and brake, and a regular steering wheel that connects with the head of the motorcycle through bevel gears. An elongated "hood" covers the front portion.



Transforming a Motorcycle into a Roadster: The Special Body, Which Makes This Possible, is Pictured on the Right. A Close View of the Steering Wheel is Shown at the Left

SPARK PLUG WITH GAS VALVE ACTS AS AUTO STARTER

An automobile spark plug that acts also as a priming valve, and so serves as an engine starter when battery current is used for ignition, is the novel invention of a Massachusetts man. A gasoline line from a priming pump on the dash connects with each plug by insulated piping, and check valves in the plugs prevent return pressure. After priming, the ignition switch alone starts the cylinder then in sparking position.



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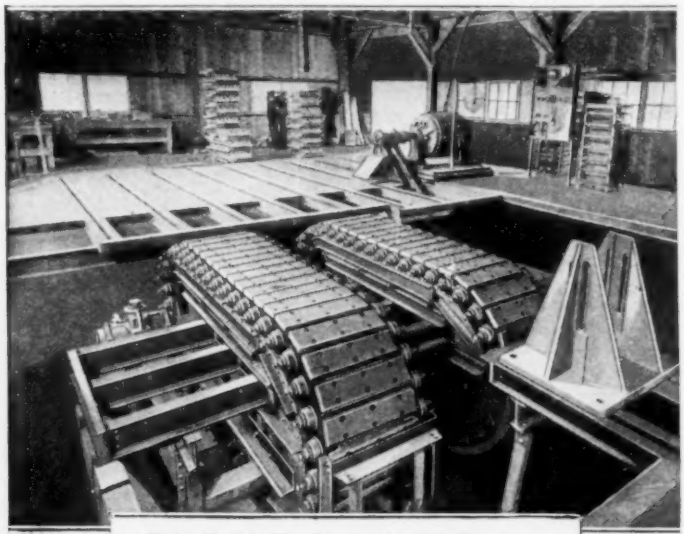
Combined Spark Plug and Priming Valve: A Dash Pump Forces Gasoline through the Devices

TREADMILL TESTS TRACTORS BY DRIVING DYNAMOMETER

While performance tests in the field give much information about a tractor, truly scientific tests must be made indoors. A mid-west university has recently installed very complete equipment for this work. A movable track, constituting virtually a double treadmill on which rest the wheels or treads of a tractor under test, is supported at the floor level by idler wheels. It is geared to an electric dynamometer, operable as dynamo or motor, with indicating instruments that measure directly the brake power of the tractor. At the same time the tractor's drawbar is connected to a 5-in. ball-bearing drum operating a heavy pendulum, with a recording arm at its upper end bearing on a vertical brass plate, adjustable to position according to the load. The time element is electrically recorded simultaneously. The track treads, 26 in. wide, are adjustable for the heaviest tractors up to 84 in. wide and 96 in. wheelbase.



Twin Treadmills, Level with the Floor, on Which the Drivewheels of the Tractor Rest: The One at the Left Is Adjustable Laterally

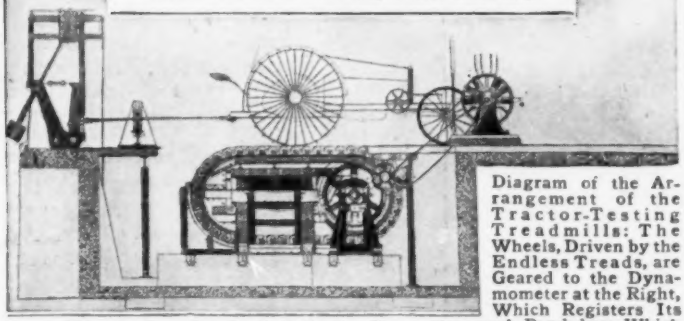
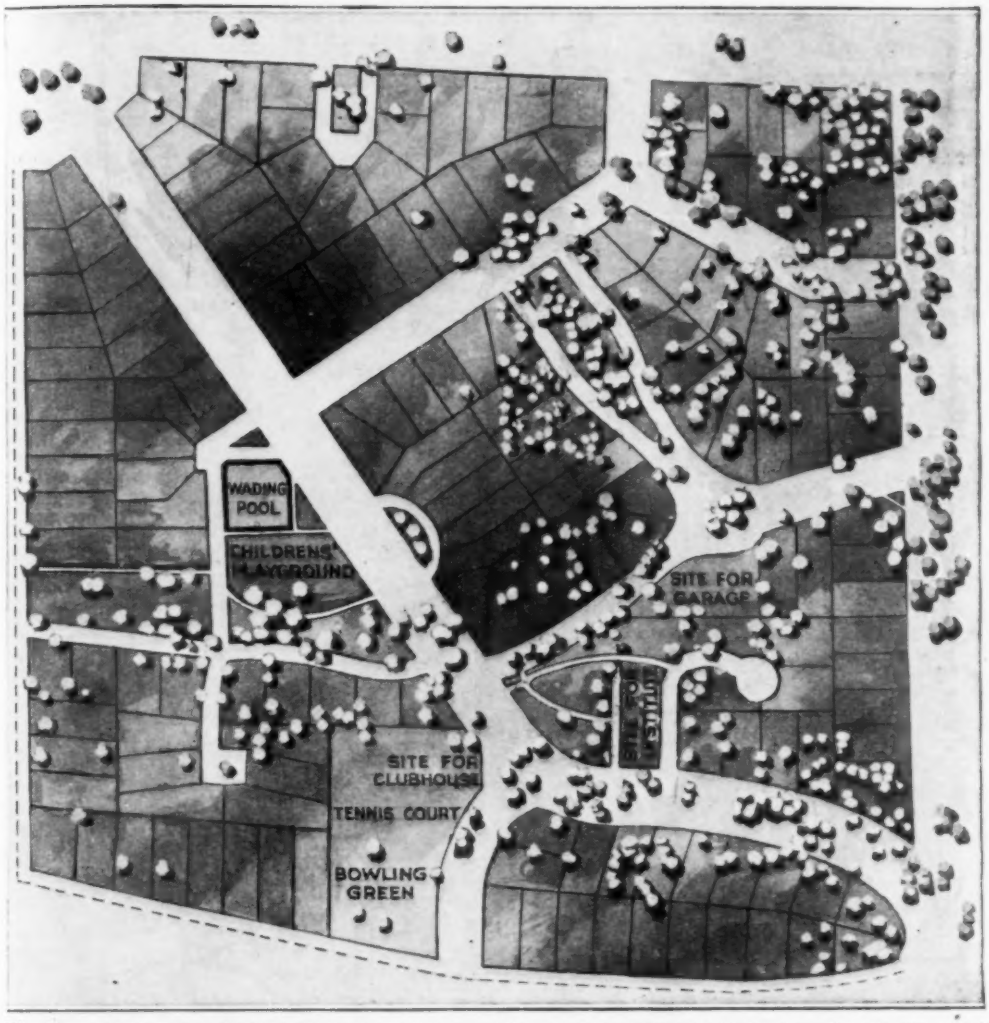


Diagram of the Arrangement of the Tractor-Testing Treadmills: The Wheels, Driven by the Endless Treads, are Geared to the Dynamometer at the Right, Which Registers Its Load Electrically. At the Left Is the Drum-Operated Pendulum Which Records the Drawbar Pull on the Plate at the Top

TORNADO RECORDS OF KANSAS ARE SUBJECT OF STUDY

Tornado records of the Topeka office, U. S. Weather Bureau, show that the state of Kansas has been visited by 302 of these peculiar wind storms in the last 33 years. Meteorologist S. D. Flora, in making the findings public, not only verifies the old stories of straws blown into timbers, and feathers removed from chickens, but adds others still more strange. In one curious case reported, a window sash was blown from a railroad station, and deposited on a distant lawn, with a heavy scale weight resting on its unbroken glass. A fragile coal shed filled with refugees was unharmed, while large trees all about it were uprooted, and the substantial schoolhouse to which it belonged was destroyed. Usually the typical whirling cloud pendant is formed when two clouds meet, and it is the vacuum in this so-called "funnel" that is responsible for so much destruction. The disturbances are not, of course, peculiar to Kansas, and records of its neighbors to the east might show an even greater prevalence. It is interesting to note that only nine per cent of the recorded tornadoes visited the western part of the state, the majority of them being well east of the center line.

¶The hospital at the Puget Sound Navy Yard, Bremerton, Wash., wanted a greenhouse, but there were no funds available and glass cost money. A resourceful doctor cut the Gordian knot by remembering a stock of old X-ray plates. Now the western sunlight shines through the shadows of sailor diseases upon flowers that all winter long brighten the wards.



The Town Planner has Divided Lindenlea, as Shown Above, into Small Lots, Which have been Sold to Civil Servants, and Others of Moderate Incomes, at Very Low Prices. All Eyesores are Excluded from This Garden Spot, Just as Every Provision is being Made for the Health, Comfort, and Convenience of the Lot Owners

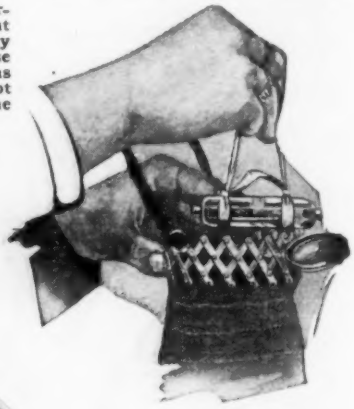
NEW SUBURB OF OTTAWA TO BE GARDEN SPOT

On a wooded tract of 20 acres near the residence of the governor-general of Canada, the Ottawa Housing Commission is fostering "Lindenlea," a garden-suburb project that deserves the interest of all who believe that better homes make better citizens. The commission recently bought the land outright, and divided it into modest lots, which were sold at prices ranging from $400 to $600. The commission's one aim is to make Lindenlea a pleasant place to live in. For this reason, noisy motor trucks and other heavy traffic will be confined to one thoroughfare. On the other streets, laid out in graceful curves that give character to the lots abutting on them, mothers may consequently let their children play without fear of accidents. Grounds for a community center, athletic field, wading pool, and garage, form a tenth of the total area. Every existing shade tree will be conserved, so far as possible. Electric wires will be laid underground; billboards and unsightly fences will be prohibited. As an assurance of general architectural harmony, the commission has ordained that every house shall be designed in the office of the town-planning adviser.

SOME NOVEL AND LITTLE-KNOWN ACCESSORIES

Pressure on the Button Separates the Aluminum Pocket Case, at the Right, into the Hairbrush and Mirror Seen Above

The Ingenious Perfume Bottle Seen at the Right is Safely Carried in the Purse or Shopping Bag, as the Contents will Not Spill Even with the Corks Removed



The Cast-Iron Kettle Above is Covered with a Perforated Lid through Which Liquid may be Poured

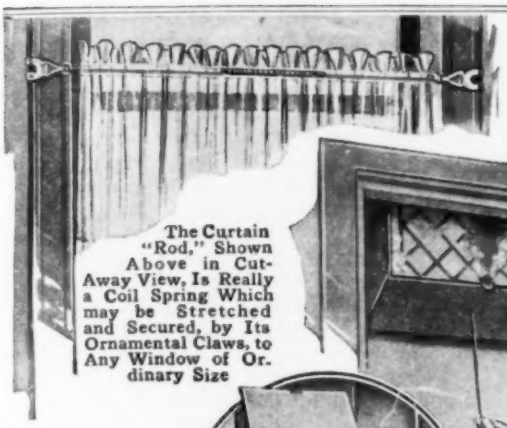
The Lightweight Insole Below is Designed to Throw the Weight of the Body on the Outer Edge of the Foot, and So Restore a "Flat" Foot to Normal

The Waterless "Hot-Water Bottle" Above is Made of Metal, and is Filled with a Chemical Compound That Holds Heat for Eight to Twelve Hours

The Baby Soon Learns to Walk When Assisted by This Steel Frame, Which Rolls Easily on Its Four Casters. The Fabric Which Supports the Baby and Forms the Tray Is of Washable Duck. The Entire Apparatus can be Folded to a Small Compass

Fingers are Saved Annoying Abrasion When This Inexpensive String Cutter is Screwed to Sewing Machine, Shop Counter, or Wrapping Desk. The Blade is Easily Removed for Resharpening When Dull

This Patented Baby-Carriage Screen Protects the Small Occupant from Annoyance by Insect Pests. It is Made of Three Hinged Sections Which are Held in Place by a Spring around the Lower Edge. It is Rolled Up When Not in Use



The Curtain "Rod," Shown Above in Cut-Away View, Is Really a Coil Spring Which may be Stretched and Secured, by Its Ornamental Claws, to Any Window of Ordinary Size

The Two-Pointed Prong Set into the Ash Tray at the Right Enables a Smoker to Empty His Pipe Bowl with Little Effort

Closet Space Ordinarily Wasted is Occupied by This Hat Box, Which Hangs, Normally, Close to the Ceiling. A Pull on the String Brings It within Reach

This Kitchen Utensil of Nonrusting Metal is Pushed through an Apple Core. As It Nears the End, the Coil Spring Ejects the Core

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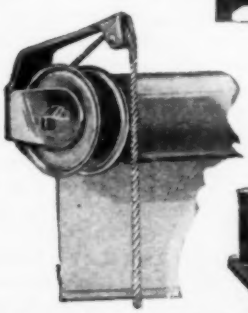
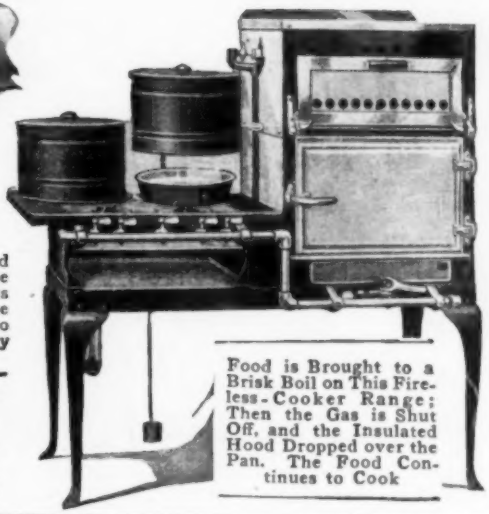
No Matter How Often the Awkward Partner Steps on This Dancing Pump, It is Held Firmly to the Foot by the Strap Which Encircles the Ankle



An Even Pull on the Cord Raises the Window Shade Carried on This Springless Roller. A Quick Release Drops the Squared Axle into the Lock Socket. Gravity Lowers the Shade

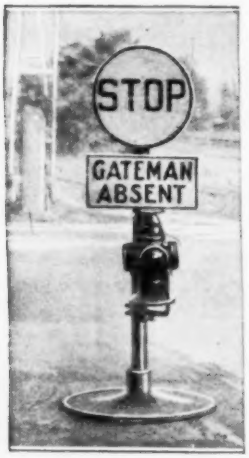
The Modern Housewife's Dislike for the Untidy Wax Candle Generally Prevents Use of Ornamental Candlesticks. So This Little Electrical Attachment is Now Made to Replace the Candle



Food is Brought to a Brisk Boil on This Fireless-Cooker Range; Then the Gas is Shut Off, and the Insulated Hood Dropped over the Pan. The Food Continues to Cook

ABSENT GATEMEN REPLACED BY WARNING SIGNS

Investigation of many grade-crossing accidents along the route of an extensive railroad system disclosed that a large proportion occurred at night. In almost every case the driver claimed ignorance of the fact that gatemen are commonly on duty only during the daytime. In consequence, signs of the type illustrated have been supplied to these gatemen. Leaving his post at quitting time, each man sets his metal deputy by the roadside, and so robs the motorist of his last excuse for incaution.



MANICURE-SUPPLY RECEPTACLE HAS FIVE COMPARTMENTS

To obviate the necessity of inconvenient and unsightly assortments of bottles and jars on the manicure's work table, a device is being manufactured for holding all the preparations employed in treating the nails and hands. A five-sided block of glass is provided with five depressions, or wells, in which can be kept different polishes and solutions. The contents of the divided receptacle are protected, when not being used, by a revolving cover as shown in the illustration.

BRITISH INVENTORS ANNOUNCE CREATIONS OF PAST YEAR

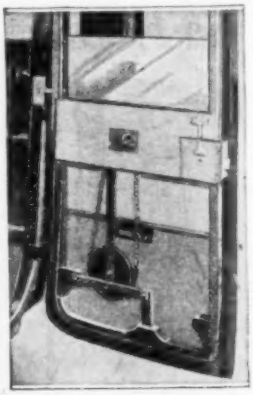
Announcement was made at the annual meeting of the Inventors Union, convened recently at London, of several inventions that may prove revolutionary. One British inventor has originated a method for producing fluorescent dyes from inorganic matter. Another exhibited an almost frictionless gear which promises to make present mechanisms obsolete. The science of aeronautics was affected by the reported discovery that easiest flight is along an undulating course like that taken by birds and fishes. Description of a "cinematograph stereoscope" suggests that the morning paper of the future may carry a "movie" supplement which will be enjoyed at the breakfast table.

TILTING STOOL FOR SURGEONS HAS JOINTED BASE AND LEG

When performing operations, surgeons frequently find it necessary to change their positions, in order to obtain different views of the work in hand. A new hospital stool is designed to make these shifts less difficult. The single leg of the device is attached to a heavy metal base by means of a ball-and-socket joint, which allows the seat to be tilted in the desired direction without in any way changing the position of the base.

WINDOW-REGULATING DEVICE FOR CLOSED AUTOMOBILES

Closed motor-car windows are lowered, raised, or locked in any position by a simple mechanical device that appeared on the market recently as a substitute for the straps commonly used for this purpose. The contrivance includes two sprocket wheels, one equipped with an operating crank, and the other with a counterbalancing spring. An endless block chain runs over the wheels, and is attached to the lower edge of a window sash. All the parts, excepting the crank, which protrudes, are designed to be concealed under the window.

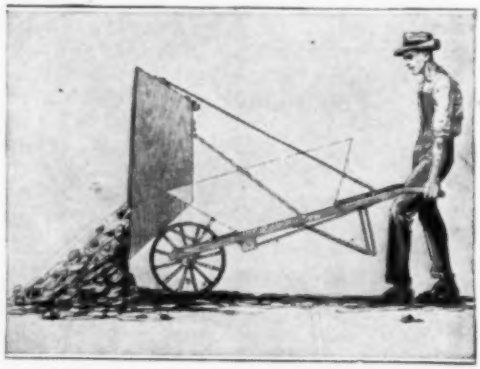


ODOR SPREADS ALARM IN MINE'S FIRE DRILL

The miner who is unable to smell banana oil or garlic may be refused work in the underground mine of the future. For the federal Bureau of Mines, after years of experiment, has found that these odors, not electric bells or lights, are the best possible means for spreading an alarm, and bringing men to the surface. In a recent test in a Montana mine, employing hundreds of men in miles of drifts and tunnels, the new alarm system worked so perfectly that every man was out in 15 minutes. Spreading the odor was easy, thanks to the compressed-air system, installed, incidentally, in every large mine to operate drills, and ventilate headings. The oil was stored in a container at the compressing station. At a signal from the superintendent, the watchman turned a valve, the volatile oil was sucked into the main pipe, and in an instant had reached every nose in the mine. Even more effective than banana oil, would have been a horribly repulsive chemical of concentrated garlic odor.

TRAY OF NOVEL WHEELBARROW TILTS TO DUMP LOAD

Recently issued patents include one for an unusual wheelbarrow, which is equipped with a tilting tray that dumps a load in front of the conveyance, and a device for returning the tray to its normal position after the performance of this operation. The tray is hinged to the side bars of the vehicle near the wheel. To unload the barrow, the tray is swung upward and forward to a nearly vertical position, in which it is supported by a triple-jointed rod. A spring-operated winding drum, located underneath the tray, serves to pull the latter back into place by means of cables.



Front-Dumping Wheelbarrow: The Empty Tray is Returned to the Side Bars by a Spring-Operated Winding Drum

¶Five divisions of the German army, it has just been learned, were held east of Verdun, from Oct. 22 to Nov. 11, 1918, by the supposed concentration in that sector of the American "X Army." The "X Army," composed of members of the Intelligence Section, First Army, A. E. F., convinced the Germans during these days, by apparently careless use of the telephone and wireless, that they were confronted by a considerable American force, and so held them, while Pershing busied himself elsewhere.

HAND-DRIVEN PROPELLER FOR SMALL BOATS

Manually turned screw propellers for small water craft are provided in the recently patented device of a western inventor, who recommends them as a substitute for oars. Essentially, the mechanism consists of a shaft, designed to be revolved by two pairs of cranks, to which it is connected by gears, and fitted with a screw. Seats for two operators are located in convenient positions near the cranks. Pedals, attached to the tiller with cables, are used for steering. The device can be installed in any rowboat, and is capable of producing a fair rate of speed.

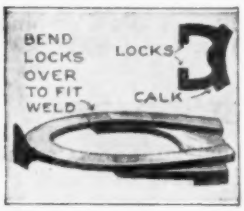
The Arrangement of the Hand-Operated Screw for Small Boats can be Seen in This Illustration, Which Also Shows the Pedal-Controlled Steering Apparatus

ODD BABY CARRIER HANGS FROM MOTHER'S SHOULDER

The impracticability of loading a baby carriage on surface or subway car has abolished for city mothers the good old custom of "taking baby along." With a view to the revival of the ancient practice, however, a Londoner has created a bulkless baby carrier that is slung from the shoulder, as pictured. In its simplest form, the carrier consists of a shoulder strap, a veneered board about the length of the baby, and a belt which holds the squirmer in place. The broad shoulder strap is adjustable.

HORSES' HOOFS BENEFITED BY RESILIENT HEELS

Intended, like the familiar rubber heel, to absorb the jars of contact with city pavements, a resilient, steel heelplate is now manufactured for attachment to the ordinary horseshoe. The heel is supplied in a flat form to the horseshoer, who attaches it by bending and welding two locking bars to the sides of the shoe. As only the fore part of the heel makes contact with the shoe in this way, the rear of the shoe becomes a shock absorber for the quarters of the hoof.



DRAINAGE DITCHES IN SWAMPS BLASTED WITH DYNAMITE

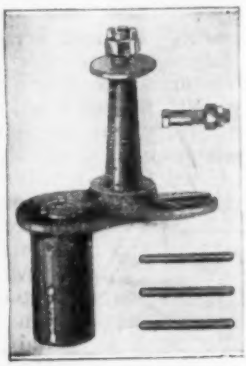
Dynamite performs the tasks of many men, quickly and economically, in the swamps of southern Florida, where the explosive is utilized as a substitute for expensive human labor in the construction of drainage ditches. A very simple method is employed in the work. Holes are made at 3-ft. intervals along the surveyed line of the excavation by thrusting an iron rod into the ground to a depth of 3 or 4 ft. In each of these cavities is placed one-fourth of a dynamite stick and a percussion cap. About one-half mile is prepared in this manner before the charges are exploded. The latter operation is performed by lighting a fuse, which is attached to the piece of dynamite in the last hole of the series. Concussion serves to set off the other charges.

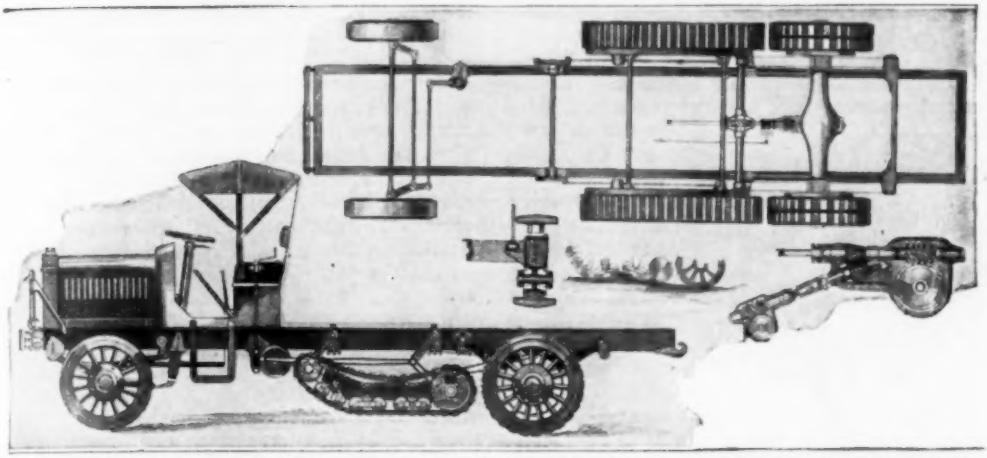
TELEPHONE-DIRECTORY HOLDER DESIGNED FOR OFFICES

Among the latest office appliances is a novel telephone-directory holder, which is suitable for attachment to a desk with a screw clamp, or to the wall with a bracket. The device comprises a swinging arm, on the free end of which is pivoted a folding rack. When not in use, the book can be closed, and moved to a position that is out of the way, and at the same time convenient. The rack opens automatically when the contrivance is extended, and provides a substantial support.

APPLIANCE HOLDS WHEEL WHEN AXLE SHAFT IS BROKEN

When the rear-axle shaft of a certain type of small automobile is broken, it is usually impossible to move the machine, because the wheel lost in the accident cannot be replaced until after the installation of a new shaft. For use in such cases, there is now on the market a device that can be attached with ordinary tools. It consists of a tubular sleeve that fits the shaft end and has a spindle for receiving the wheel.





Endless-Tread Attachment for Motor Trucks: The Device, Hung by Toggle Joints to the Frame of the Truck, is Seen in Side Elevation at the Bottom and in Plan at the Top. The Small Views Give Details of the Controlling and Driving Mechanisms

ENDLESS-TREAD ATTACHMENT IS HUNG ON TRUCK FRAME

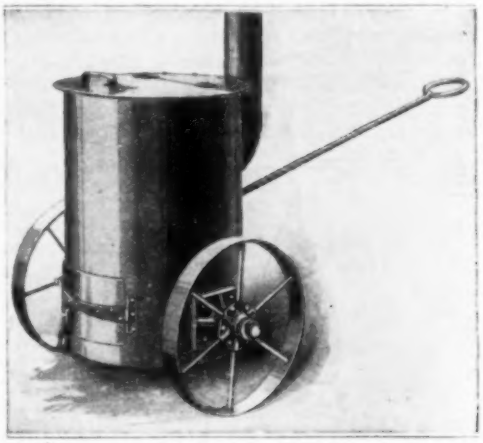
To give the advantages of endless-tread traction to motor trucks of ordinary form, an Ohio inventor suspends an independent tread mechanism from the truck frame, just ahead of the rear wheels. The device thus serves either as an attachment for complete vehicles, or as a built-in portion of a new form of truck or tractor. The auxiliary tread is thrown into or out of engagement with the ground by a control arm at the driver's hand. Bevel and worm gears from the main axle drive the endless chains of the tread. The idlers on which the chain runs are mounted in pairs pivoted to a spring suspension, so that uneven surfaces are traversed with unusual facility.

LIGHT FOR VIEWING COLORS HAS PATCHWORK REFLECTOR

An electric-lighting unit which renders color values practically as well as daylight has been devised by an English artist, aided by an engineer and an army camoufleur. Below the powerful incandescent lamp is an opaque, polished reflector cup. Above is a large reflector screen covered with varicolored patches of small size, worked out by mathematical formula. The result is reflected illumination closely approximating daylight, and giving excellent visibility to all colored articles. Though much light is absorbed by the reflector, necessitating lamps of 60 cp., or more, the invention may prove valuable to many industries in which color-blending processes are used, and promises to find a place in color photography, where its reliable chromatic qualities would be of service.

SMALL ASPHALT HEATER MADE FOR REPAIR OF RURAL ROADS

For the routine maintenance and emergency repair of asphalt roads beyond city limits, there is now made a little heater that is easily drawn behind the road patrolman's wagon or automobile. It is made of steel in the conventional proportions, but stands only about three feet high. Eight gallons of repair material are held, at the top of the furnace, in a kettle welded to the shell.



This Diminutive Asphalt Heater is Intended for the Use of the Road Patrolman Whose "Beat" Takes Him into the Isolated Rural Districts

EXERCISER AND VAPOR BATH COMBINED IN NEW DEVICE

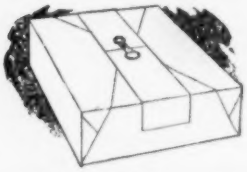
Exercise and vapor baths are recognized means for reducing flesh. Both methods can be employed at the same time by using a recently invented device. A nearly air-tight cabinet incloses a bicyclelike contrivance, designed to be operated with pedals, and equipped with an adjustable brake, besides an electric heater and a water container. The apparatus also includes a thermometer for indicating the temperature inside the case.

SIX BOATS LAUNCHED IN ONE DAY BY WESTERN SHIPYARD

American shipbuilding companies almost daily astonish the world with some record-breaking accomplishment. Recent examples include the achievement of a western coast concern, which established a precedent by launching six vessels in one day at the same yard. The craft were constructed for the United States Shipping Board. An official of this organization released the first boat from the ways by pressing a button at Washington, D. C.

PACKAGE FASTENER DESIGNED TO TAKE PLACE OF TWINE

An easily attached clasp for packages, intended to supplant twine, is now on the market. Two short paper tapes, gummed at one end, compose the device. At the opposite end, one of these strips is equipped with an eyelet, and the other with a metal hook. To apply the contrivance, the tapes are moistened, stuck on the wrapper, and fastened together by inserting the hook in the eyelet.



FIND THIRD MEXICAN PYRAMID IN "CITY OF THE GODS"

At Teotihuacan, "City of the Gods," 27 miles northeast of Mexico City, has been unearthed a third pyramid, even larger than the famous pyramids of the Sun and Moon, near by. The discovery in itself means little. Archæologists are hopeful, however, that continued excavation will disclose underground chambers, etc., containing significant relics, and so dissolve the obscurity that shrouds the origin and cultures of the races that once thrived about the Gulf of Mexico. The pyramids of the Sun and Moon at Teotihuacan, it may be remembered, are huge adobe mounds, with sides oriented to the quarters of the compass, and with small summit platforms where were performed horrible sacrificial butcherings.

DOCTOR INVENTS GERM-PROOF DRINKING FOUNTAIN

Myriad drinking fountains have been devised, but, so far as can be ascertained, none employs exactly the same means for preventing the accumulation of germs as that used in the recently invented contrivance of a western physician. The new device consists of a brass cup, in the center of which is placed a vertical nozzle. Water thrown from the latter reaches a considerable height, and makes it unnecessary for the lips of a drinker to touch the fountain. Further protection is provided by smaller streams, some projected upward from the edge of the cup, and others forced across the edge of the vessel.

ANCIENT FOSSILIZED SEAWEED RESEMBLES MODERN PLANTS

Examining rock samples obtained in the Canadian Rocky Mountains, a prominent scientist has discovered what is declared to be positive proof that the seaweeds of 25,000,000 or 30,000,000 years ago were very similar to those of the present time. The evidence is in the form of fossils, which are believed to have been living plants during the Middle Cam-

brian geologic period, when the northwestern coast of today was covered with water. The stone in which the ancient remains were found is a hard, dark-colored shale. On the surface of this material, the fossils appeared as a shiny black film. Some of the specimens have been cut into thin sections for study and comparison with modern ocean plants.

URGE CHANGE IN ROAD RULES TO ENCOURAGE MOTORISTS

Changes in the highway regulations now in force in British Columbia are being urged by local automobile and trade associations as a means of inducing motorists from other parts of Canada, and from the United States, to travel in the province. The present rules, which differ considerably from those followed elsewhere on the continent, are declared to deter tourists from including the region in their itineraries. Legislation intended to remedy this condition is being considered by provincial government officials.

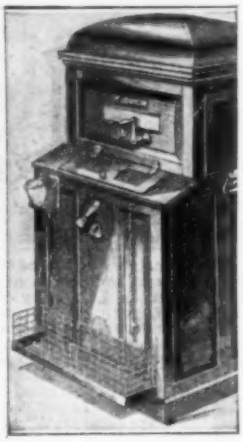
STORAGE-BATTERY CARE MADE EASY BY COMPACT OUTFIT

The automobile owner finds it easy to give his storage battery proper attention when his garage is equipped with a maintenance outfit now on the market. It consists of a half-gallon glass jar for distilled water, the fiber cap bearing a dial with movable indicator, which shows when the battery was last filled. Through a central hole in the cap hangs a glass syringe, with which the distilled water is transferred from bottle to battery. Within the syringe, again, lies a small hydrometer, which registers the strength of the battery by indicating specific gravity, when some of the sulphuric-acid solution is sucked up by the syringe.

¶The first recorded professional use of the airplane by an insurance adjuster was the flight of 215 miles and return recently made in a single day from San Francisco to the scene of a distant conflagration.

VENDING DEVICE SELLS SOFT DRINKS IN BOTTLES

Soft drinks are dispensed in a novel manner by a new vending machine. A wooden case contains the mechanism, which is operated by a crank that can be turned only after a coin has been placed in a slot. The crank rotates a circular holder, designed to drop the neck of a filled bottle through a hole in the case, and support the receptacle in such a position that its contents can be drained into a paper cup, which is released simultaneously with the bottle. A tool for opening bottles is chained to the device. In the upper portion of the contrivance is an ice chest, while in the base there is a water tank, into which empty bottles are dropped.



MOTOR IN STOOL BASE HELPS PHOTOGRAPHER POSE SUBJECT

The cylindrical stool pictured herewith is meant to aid the portrait photographer in posing his subjects. From a switch mounted on the rear of the camera, wires lead to an electric motor concealed in the base of the stool. With his hand on the switch, the photographer is consequently able to turn his subject until the desired view, profile, full face, etc., is seen. The apparatus is found most useful in posing children, though by lifting out the wicker seat, it is made comfortable for adults. The stool body is painted in any desired finish.

Constructing Model Ocean Liners and Air Craft Is the Hobby of an Ingenious Western Youth, Who is Shown Here with Two Examples of His Handiwork. The Ship, Which Is Accurate in Every Detail, is Equipped with a Wireless Set. A Rubber Band Propels the Biplane

Gluing Together Hundreds of Ordinary Matches the 15-Year Old Seattle Boy in the Picture Completed a Sweet-Toned Ukulele after Eight Weeks of Patient Labor

These Obviously Happy Children are Riding in One of the Sidewheel Boats Provided for Their Amusement by the Authorities of a Town on the Isle of Wight

A Domestic-Science Kindergarten: In a Certain London Nursery, Children from Two to Five Years Old are Taught the Duties of a Housekeeper. The Juvenile Pupils to be Seen Here have Finished Their Work, and are Busy Washing Their Hands and Faces

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A Likeness of "Princess," One of the Two Known White Kangaroos in the World, Appears on the Left. The Animal was Sent to England Recently from Australia

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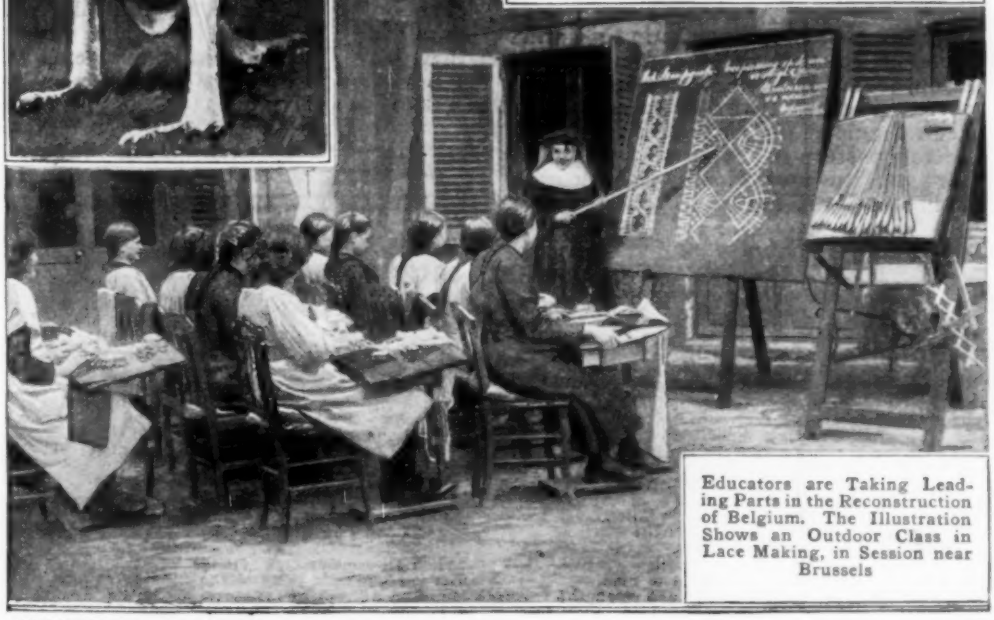
The Funeral of "Rags," Dog Mascot of a Chicago Fire Department Hook and Ladder Company, Was a Solemn Ceremony. Boy and Girl Friends of the Canine Acted as Pallbearers. "Rags," Who Never Failed to Respond to an Alarm, was Killed by being Run Over by a Fire Truck While Hurrying to a Conflagration



Educators are Taking Leading Parts in the Reconstruction of Belgium. The Illustration Shows an Outdoor Class in Lace Making, in Session near Brussels

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GROOVED PORCELAIN PREVENTS SHORT CIRCUITS IN PLUG

Short circuits in a new spark plug are declared by the inventor to be impossible.

The secret of the device lies in the porcelain, the inside of which is grooved, not smooth, as in the case of an ordinary plug. More resistance is offered to current by carbon that forms on the uneven surface than by the gap between the points, due to the fact that the distance through the material is much greater than if the porcelain were smooth. As a result, a spark is produced by the contrivance, even when the porcelain is coated with carbon.

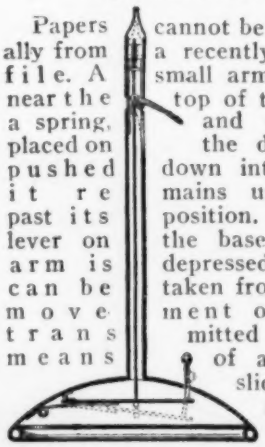
MOTOR TRUCK HELPS MAKE BEES WORK OVERTIME

The motor truck is proving a valuable ally to many beekeepers of the western states, enabling them to prolong the gathering season and thus increase the yearly harvest of honey. During the past summer, for example, an apiarist in California moved his colonies, at the end of the local season, from his home, to a great orange grove 64 miles away. Several weeks later he guided his motor-truck caravan to fresh pasture in a foothill cañon, and later still to a lowland bean-blossom patch. In Utah, the triple recurrence of the alfalfa crop lengthens the season to the beekeepers' profit, but even here the motor truck is often used to carry the hives to isolated tracts of alfalfa or clover.

TWO BIGGEST MOVIE STUDIOS BEING ERECTED IN EAST

A whole city block is occupied by the glass studios and open-air stages of a giant new motion-picture plant now in process of erection on Long Island. The ground area of the site is more than 140,000 sq. ft., and the building cost alone will reach $2,000,000. At the same time, and not very far away, another mammoth studio building, four stories high, has been started, its dimensions being 332 by 200 ft. Movie producers who are establishing these permanent factories in the East assert that every variety of scenery desired for picture making can be found within a few miles of their location.

ARM ON NEW SPINDLE FILE GUARD FOR PAPER



Papers cannot be removed accidentally from a recently patented spindle file. A small arm is held extended near the top of the hollow spike by a spring, and when material is placed on the device, the arm is pushed down into a recess, where it remains until the paper is past its position. By pushing a lever on the base of the file, the arm is depressed so that papers can be taken from the spike. The movement of the lever is transmitted to the arm by means of a tiny rod, which slides inside the spike, and is attached to both of these parts.

THE STEAM SHOVEL

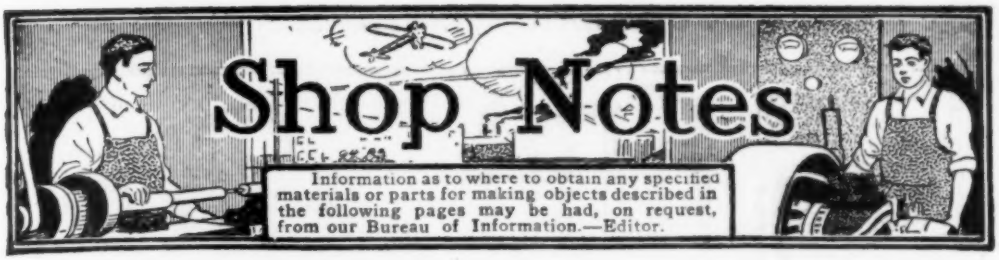
BY LYDIA M. D. O'NEIL

After the bidding is over and done,
After the fight for the contract is won,
And the chief engineer to the starting point comes
With all the details at the ends of his thumbs,
And the big Irish bosses arrive on the scene,
Lips lovingly locked on the faithful dudeen,
And the navvies assemble, their wages to win,
It is time for the steam shovel's work to begin!

From Culebra Cut to the far Simplon,
I have groped in the depths of earth;
From the Jersey flats to the steep Cajon,
I have proven my lasting worth!
Railroad, tunnel, canal, or mine—
When all is completed at length,
It stands as a proof of the genius of man,
And proof of the steam shovel's strength!

The dust of the desert or swamp soil moist,
Alike shall I gather, alike shall I hoist;
I shall move a mountain or change the course
Of the river that taunts you with furious force.
I shall deepen the harbors and widen the fills,
And gouge you a path through the heart of the hills;
Extend you the margins of whimpering seas,
And laugh in the matching of power with these!

From Port Sudan to the far Cascades,
I shall go where the blueprints lead;
From Ningpo-fu to the Everglades,
As the contract's terms may read.
Railroad, harbor, canal, or mine—
When all is completed at length,
Let it stand as a proof of the cunning of man,
And a proof of the steam shovel's strength!


Shop Notes
Information as to where to obtain any specified materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

How to Build a Portable Summer House

By EDWARD H. PRENTICE

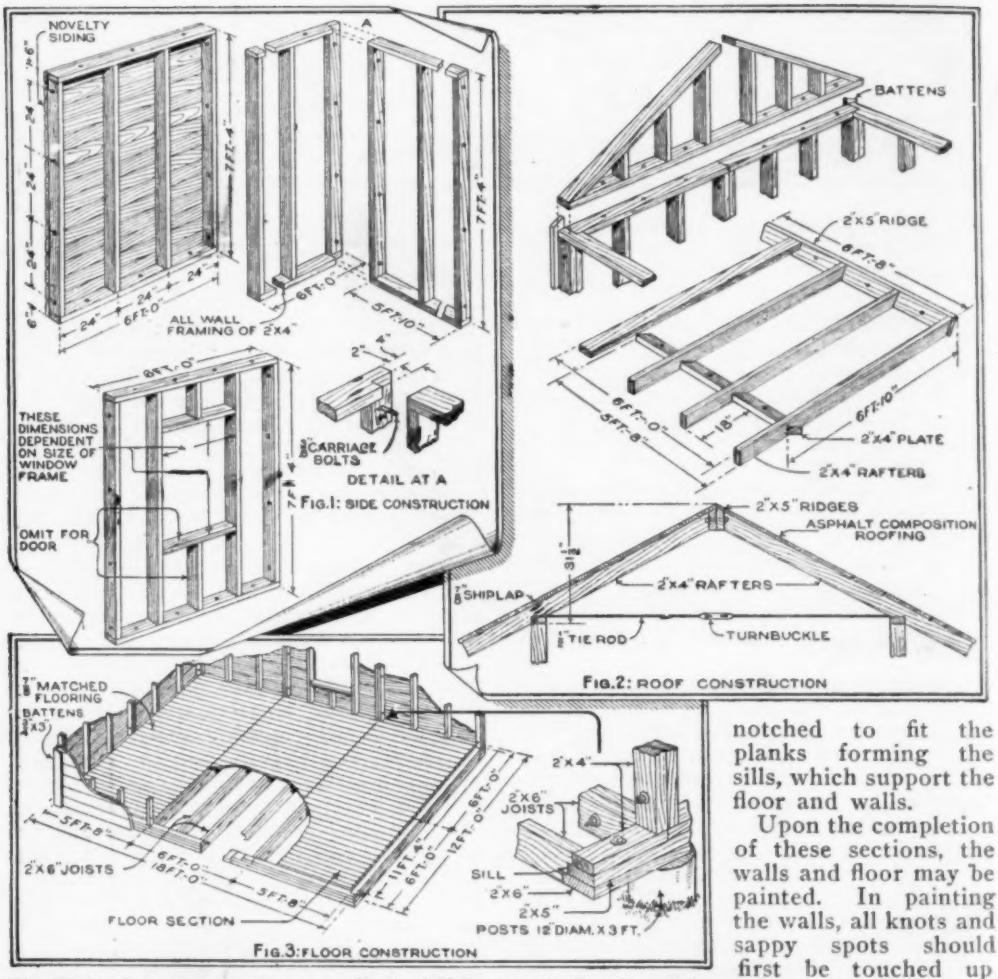
A COMFORTABLE place in the country, for the hot summer days, is easily provided by devoting a few hours to the construction of a portable house. A barn, cellar, or garage will be large enough to work in, and when the time comes to get into the country, a load or two on a motor truck, and a day's work setting it up, will find the owner fully prepared for a summer's enjoyment.

The following directions are for a one-room house, 12 by 18 ft. in size, but the plans are capable of infinite variations which the builder's fancy or needs may dictate.

The first step in the construction is to build the side-wall panels. For the framing, 2 by 4-in. pieces are dressed on four sides, and cut and fitted as shown in Fig. 1. For the sake of clearness, the dimensions are given on the assumption that the frame pieces are exactly 2 by 4 in. in size, but the dressing will reduce them about ¼ in. on each side, and the working dimensions must be modified accordingly. Allowance must also be made for window and door frames. It will be found just as cheap, and more generally satisfactory, to buy these window and door frames from a lumber mill than to attempt to make them. The frames are set in the openings provided for them, and nailed in place.

The next step is to cover the sections with siding. Before it is nailed on, carefully test each section for squareness. This can best be done by measuring the diagonals. If both diagonals of each section are of the same length, the sections will be square, assuming that all pieces are of correct length; if not found square, the framing must be sprung into proper shape, and kept so by a temporary brace, until the siding is placed. All four sides of the framing must now be drilled for bolt holes, which are carefully laid out so as to come into perfect alinement when the sections are erected. Considerable time can be saved and a better job done by making two templates, one for the sides and one for the tops and bottoms, and drilling the holes through them. The frames for the roof may next be made. As shown in Fig. 2,

The Greatest Part of the Labor of Building a Summer Home can be Done in the Home Shop, and the House can Then be Set Up Complete in a Few Hours



The Walls of the Portable House are Made of 10 Rectangular Panels, and the Roof of Six Panels; Two Triangular Frames Go under the Eaves at the Ends

two pairs will be required for the ends. The one pair required for the center is similar in detail, except that all four rafters are placed on edge, instead of laying the outside ones flat.

To form the ends of the walls between the roof and side-wall sections, two triangular sections must be made, as detailed. These are covered with siding, to match the side walls. To tie the roof when erected, a pair of iron rods fitted with turnbuckles will be required. The ends of these rods are formed into hooks, or eyes, and are slipped over the ends of two pairs of bolts nearest the joints between the center and end sections.

The floor is made up, as detailed in Fig. 3, in three sections. Each section is composed of five beams with ends notched to fit the planks forming the sills, which support the floor and walls.

Upon the completion of these sections, the walls and floor may be painted. In painting the walls, all knots and sappy spots should first be touched up with shellac to prevent their showing through the paint. Two coats will be sufficient.

In the erection of the building, 10 supporting posts are set firmly into the ground, where the corners of the floor sections are to come. Then the sills are placed, care being taken to have them perfectly level and square. Set up the side walls, beginning at any corner, and bolting each section in turn in its place. After the walls are set, lag their bottoms to the sills. Next, place the upper end sections of the walls, then the end sections of the roof, and lastly the center sections of the roof. As soon as the roof is in place, fasten the tie rods as previously directed, and screw up the turnbuckles until the rods are at proper tension. Composition roofing of asphalt and felt will be found very satisfactory for the roof covering.

Finally, place batten strips on all corners, and over the joints in the sections, and the summer house is ready for occupancy.

Sandpaper Prevents Slipping of Level

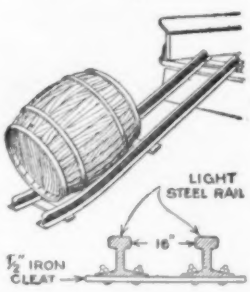
When a level is used on polished surfaces, a great deal of trouble is experienced in preventing the instrument from slipping. A simple remedy is to glue two squares of sandpaper, with the rough side out, on the sides of the level, near the ends. It is then easy to hold the level on any surface by applying only slight pressure.

Flush Soldering for Leaks

I recently had occasion to solder a coffeepot which had four or five pinholes in the bottom—a job that a near-by shop had refused with the statement that it could not be soldered satisfactorily. As the holes were very small, and it was necessary to have the bottom of the pot nearly level, to stand properly, I proceeded as follows: After brightening or cleaning a small spot around each hole, I placed the point of a small center punch in the hole from the outside, and gave a sharp blow with the hammer. This made a slight depression all around the hole; after applying the acid it is a simple matter to fill the depression with solder, making a neat job.—Frederic M. Wood, Rochester, N. Y.

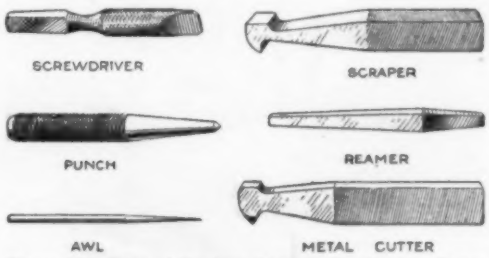
Barrel Skids Made of T-Rails

On a river wharf where many thousands of barrels are handled, a chute made of light steel rails has been found very effective. The rails are of 10 to 30 lb. per yard weight. They are bolted to cleats made of ½-in. iron, so that the two rails are about 16 in. apart. By bending them slightly, as in the cut, the barrel slows up before it reaches the ground, thus lessening danger of injury to it. Projections may be welded at the underside of the rail at one end, so that it will be held from slipping off the wagon bed, or platform.—J. B. Woods, West Burke, Vt.



Handy Tools Made from Old Files

For the workman who has spare time and a forge fire, a bunch of old worn-out files form the raw material from

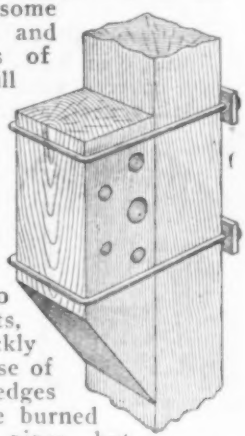


When Old Files of Various Shapes Are Handy, These Shapes may be Utilized in Forging Them into Various Other Metal-Working Tools

which many useful tools can be made. Six of these are illustrated in the drawing; the kind of file from which each is made will be apparent from the illustration. Almost every style and shape of file in common use can be taken advantage of in the construction of some other cutting tool.—Frank H. Sahlmann, Manhattan, Kan.

Pipe-Bending Post

In small shops where pipe bending must be done occasionally, a post fastened permanently in some part of the shop and bored with holes of various sizes, will be found a very convenient accessory. Iron pipe must ordinarily be heated for bending, and often filled with sand in order to avoid buckling. It is then thrust into whichever hole it fits, and the bend is quickly made without the use of a vise. In time, the edges of the holes will be burned away by the hot pipes, but roundness at the edges is not objectionable, and, besides, the making of a new block is not a matter of a great deal of labor.



When using an electric iron, if the cord is run through a ring around the arm just below the elbow, or a bicycle trousers' guard attached there, the cord will be kept away from the board.

Auto Operates Tank Pump

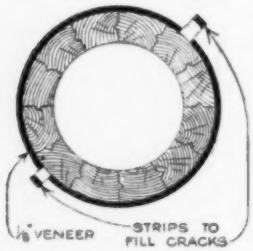
It is becoming quite common to use automobiles as a source of power, but it is not always possible to do this

Without the Use of Pulley or Belt, the Automobile is Used to Drive a Water Pump on a Farm

without the use of a transmission belt. The photograph shows how a connecting rod was bolted directly to one of the rear wheels of the car, jacked up off the ground for the occasion. The rod was a 2 by 4-in. timber, and the other end was connected to the plunger arm of the cylinder water pump. As the pump requires a slow operating speed, and not a great deal of power, the automobile engine handled it successfully. —T. A. Leadley, Lincoln, Neb.

Veneering Large Round Columns

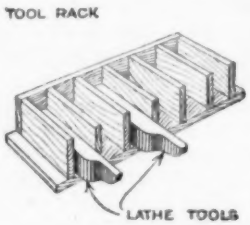
Our shop had an order for three wooden columns, 8 in. in diameter and 8 ft. long, to be covered with ⅛-in. quarter-sawed, red-oak veneer, after being built up and turned. Having no special equipment for this job, nor any round-cut veneer, I cut six pieces of ⅛-in. flat veneer, wide enough so that two pieces would nearly cover the surface of one column, leaving a space of ⅛ in., or a little more, between the two pieces. These wide pieces were softened in hot water, and tied around the columns with small cords. The columns were then put into a kiln for 10 hours. At the end of this time the veneer was pretty well formed to shape, and ready to be glued. Each column was swung on centers, so it could be turned with a crank. The veneer was glued to it, and while one man turned the column, cheap sash cord was wound over it like thread on a spool. When the veneer was all covered, the cord was wet with hot water. This caused it to shrink, and hold the veneer very tightly to the column. After another 24 hours in the kiln, the columns came out perfectly hard and solid. Narrow strips of the same veneer were cut to fit the cracks between the wide pieces, and glued in. The columns were then finished with sandpaper on the lathe, and a beautiful job was the result.—E. K. Wehry, Cedar Rapids, Ia.



END VIEW OF COLUMN

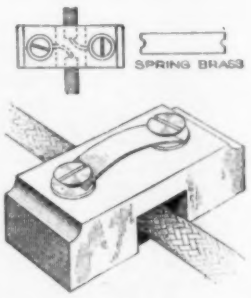
Rack for Lathe Tools

When lathe tools are thrown into a box or tray indiscriminately, the cutting edges are frequently damaged, so that regrinding is necessary. Also, where a variety of tools are used, valuable time is lost in hunting up the right one. The drawing shows a simple and effective arrangement, by which each cutter is kept separately, and in a place where it may be found without loss of time.—J. H. Moore, Toronto, Ont.



Secret Ignition Switch for Car

If an automobile thief knows just where to look for a locked break in the ignition circuit, he will quickly accomplish his end and get away with the car. If there is a break that cannot be located, however, he will be delayed, and the more difficult the finding of the break, the greater the delay. The following is a scheme that is very hard to detect. Make a little cleat of wood or fiber, or use an ordinary ready-made cleat such as is used to hold wiring in position. Instead of running the wire straight through, however, as is usual, cut the wire and bare the ends. Drill small holes so that the ends of the wire can be run to the screws used for holding down the cleat, putting cop-



per washers under the screws. Do this work so that there is nothing to indicate how the wire is run. Use flat-head screws with heads large enough to project above the copper washers. When the cleat is screwed down there will be nothing whatever to indicate that it is anything but the ordinary arrangement. There will be a perfect break in the circuit, however. To complete the circuit, use a little piece of spring brass or copper with the ends notched out, a little longer than the distance between the two screw heads. Spring the brass until the notched ends will catch under the projecting screw heads, and the circuit is completed. Remove the strip, and it is broken, though nothing shows it. Such a lock is so easily made that it is very little trouble to put two or three in the circuit in different places, and it will take a clever thief to untangle the puzzle.—Howard Greene, New York, N. Y.

Round Holes Made with Cold Chisel

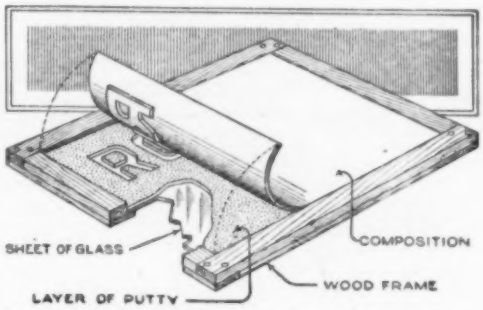
Having a number of round holes to cut in a thin sheet-iron box, I tried to cut them out with the chisels we had—cape, square-point, etc.,—but could not make a clean-cut round hole. Finally, by taking a square-edge cold chisel, and grinding a round cutting edge on it, I was able to cut a round hole nearly as clean as one which had been punched. The chisel must, of course, be held at an angle to the work, but in the case of very thin metal this is no great objection.—R. B. Miller, San Pedro, Calif.

Potato for Keeping Metal Cool

Broken tools, such as scissors, plane irons, and chisels, will not lose their temper when being repaired by brazing, if inserted in a potato. A dovetail notch is cut in each part, and a piece of steel, cut to fit, is driven tightly into the notches. The tool is then thrust into a potato, until the smallest possible portion protrudes. The moisture in the potato keeps the metal cool during the brazing process, and prevents it from losing its temper.—Réné J. Rousseau, Suresnes, France.

Sign Printing without a Press

Fence posters, sidewalk signs, and other forms of printed announcements, may be made without a printing press and at slight expense, as follows: Obtain a piece of glass and lay it on a flat surface. Moisten the face of the glass with water; before it dries, cover with a ¼-in. layer of putty and smooth off level. With a sharp-pointed knife, cut the letters through the entire thickness of putty. Moistening the glass before laying on the putty makes it possible to remove the body of the letters without their sticking to the glass. A wooden frame, ½ in. high, exactly fitting the glass, is applied, as shown in the drawing, and filled level with printers' roller compound. To make this substance, soak 8 lb. of glue in about 4 pt. of water, and heat gently until dissolved. To the glue solution add 3 lb. of brown sugar; when both glue and sugar have been thoroughly dissolved, pour in ½ pt. of glycerin. Allow this compound to stand on the mold from 12 to 24 hours. Care should be taken that the composition is not torn in removing it from the mold.



By Cutting Letters in Putty, and Making a Rotary Stamp with Printers' Roller Compound, the Printing of Signs is Easily Accomplished

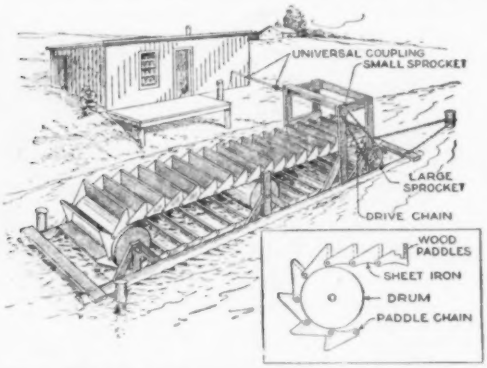
The cast thus obtained is glued to a wooden cylinder, making a rotary stamp. A nail is driven into the center of each end of the wooden cylinder, and a strong wire handle is attached.

Printers' ink, or thick paint, is then distributed over a piece of glass or slate, and the rotary stamp passed over it until the raised letters are thoroughly inked. After inking the stamp, it is rolled over the surface to be printed, and a clear-cut impression of the letters results.—J. G. Allshouse, Vandergrift, Pa.

¶Bits of uncured rubber, dissolved in gasoline, make a good rubber cement.

Paddle-Chain Water Motor

Where a steady, slow current of water is available for power purposes, a large motor of the type illustrated may form a

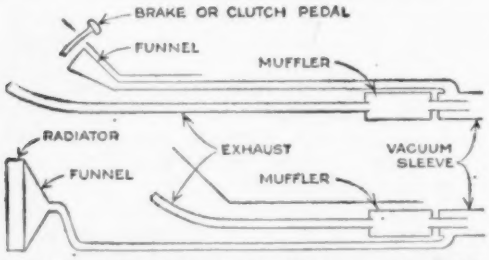


When Only a Slow Current of Water Is Available for Power, a Motor Having Many Paddles Becomes a Solution of the Problem

suitable means of developing a small amount of power. The slow speed is compensated by the heavy torque which it is possible to obtain, due to the large number of paddles. When geared up to a suitable speed, the power may be used to run small machines. The motor may be anchored in place by chains and stakes. Toy models of this type can readily be made, using tin cans for rollers, and triangles of tin metal to link the wooden paddles together.—Edward R. Smith, Walla Walla, Wash.

Exhaust Assists in Cooling Engine

The exhaust of an automobile engine, although consisting of hot gases, may be



The Hot Exhaust Gases of an Engine can be Made to Assist in Cooling, by Proper Connection

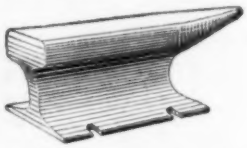
made to assist in engine cooling by making connections in either of the two ways illustrated. In the upper diagram, the force of the exhaust gas exerts a suction which carries warm air out from the rear of the engine, thus making room for cooler air thrown in by the fan. In the lower diagram, the exhaust suction is shown as taking the place of the fan. The large funnel back of the radiator catches the air as it is heated, and it is sucked out through the exhaust pipe.—J. F. Dwiggins, Detroit, Mich.

Light Globe for Cleaning Stack

For cleaning out large chimneys or smokestacks, an explosion of gunpowder or dynamite is often employed. A method which is handier and cheaper, in many cases, is to explode an old burnt-out incandescent-lamp bulb. Break off the tip of the lamp, under water, and admit a small amount of water; the rest of the globe will of course fill up with air. Then close up the hole by directing a blowpipe flame against the tip. When this globe is placed in the stack, the heat from a fire at the bottom vaporizes the water, and finally breaks the bulb with an explosion that clears the stack. The size of the globe to use depends upon the size of the stack.—Hobart M. Kraner, Columbus, Ohio.

Small Anvil Made from Steel Rail

For the small shop, where a large anvil is not required, a thoroughly serviceable tool may be made from a short length of steel rail. The web and base of the rail are cut away, and the horn formed by forging. If suitable holes, or slots, are not already in the base of the rail, they should be cut or drilled, as shown, so the anvil may be fastened to its base.—R. L. Ogden, Denver, Colo.



Typewriter Prevents Check Raising

A very simple method of discouraging the "raising" of a check, without the use of any other machine than the typewriter, is to write the check entirely with the machine, except for the signature; then to typewrite across the space where the signature is to be a line such as "not over ten dollars." When the signature is written directly upon this typewritten line, both the signature and the typewriting can be plainly read in most cases, but any attempt to erase by chemical means the line limiting the amount of the check will necessarily injure the signature also. —Edwin R. Mason, Indianapolis, Ind.

Chimney Cleaner Made from Wire Netting and Broom Handle

To make a useful device for cleaning chimneys and flues, get a broom handle and a piece of wire netting, 2 by 3 ft. in size. With staples, fasten this netting in a roll around the broom handle. The soft wire may be bent around in any desired shape, so that it will enter into narrow openings. The tool has been found to be more effective than ordinary brushes, in getting rid of hard incrustations.

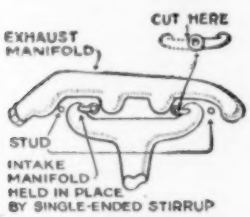
Providing Water for Bees

Bees require an abundance of moisture during the honey season. If pure water is not available, they will drink from sewers, or other foul places. When bees are compelled to depend on the farm watering trough, they become a menace to stock, and, besides, large numbers fall in and drown.

A safe and sanitary drinking place is easily made, by covering a shallow pan with wire screening. If the pan is kept filled with water, the bees will be able to drink without difficulty, and with no danger of drowning.—Bessie L. Putnam, Conneaut Lake, Pa.

Replacing Auto Engine Manifolds

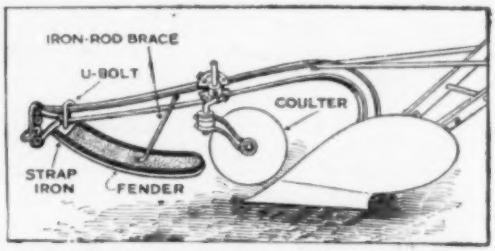
In making engine repairs on a popular make of light automobile, it is often necessary to remove both intake and exhaust manifolds, the replacement of which usually calls for an additional pair of hands. However, it is possible for one man to replace both manifolds, without difficulty by proceeding as directed below.



Two of the regular manifold-retaining stirrups are obtained, and one end, or arm, is removed from each, as shown. The intake manifold is put in place and tightened up, using the single-armed stirrups, or clamps, which are put on the two inside studs. The exhaust manifold is now applied, using the regular stirrups, which are tightened up on the two end studs. The one-armed stirrups are removed one at a time and replaced with the regular parts.—Graeme B. Baker, Deer Lodge, Mont.

Fender Turns Under Weeds While Plowing

A rainy spell at plowing time gives the weeds a good start and prevents the farmer from plowing. By the time the work can begin, the weeds, in consequence, are usually more or less difficult to plow under.

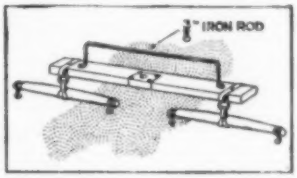


When Weeds Get a Good Start, Plowing Them Under Is Difficult. Part of an Old Auto Fender Turns the Weeds under the Coulter, Where They Are Cut and Turned under the Soil

A simple arrangement, such as shown, solved the problem for one farmer. Part of an old automobile fender was bolted to the beam of the plow, just ahead of the rolling coulter, with a long U-bolt. A piece of strap iron, riveted to the end of the fender and drilled for the U-bolt, as shown, takes up the strain when the bolt is tightened. About one-third of the way back, a brace of stiff iron rod, from the plow beam to the fender, was provided. The rest of the fender was left free, and was springy enough to allow for unevenness of the surface and yet force under all the weeds. When the weeds were green and tender, no difficulty was experienced in turning them under in a very satisfactory manner.—Dale R. Van Horn, Lincoln, Neb.

An Effective Line Guard

Any farmer who has been annoyed by the tangling of his lines with the draft rigging, while plowing, will appreciate a simple preventive. A piece of ⅜-in. iron rod is bent, as shown, and provided with an eye at each end. The rod is bolted to the doubletree with short bolts. Care should be taken to have the rod long enough to allow ample clearance for the singletrees.—H. F. Grinstead, Columbia, Mo.

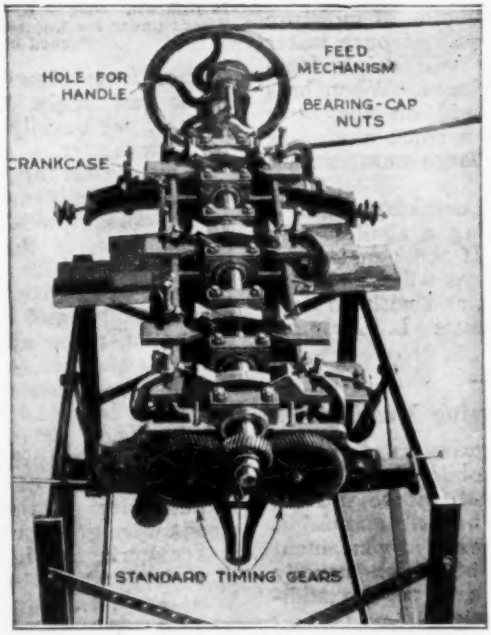


A Boring Machine for Crankshaft Bearings

By EDGAR GARDNER

MODERN high-class automobile engines are for the most part designed to use the pressure oil-feed system. Oil is conducted to each point which requires lubrication by means of pipe leads and oil passages, under pressure from a pump. The splash system is thus eliminated, and the amount of oil supplied to meet the requirements of varying engine speeds is automatically controlled, resulting in increased efficiency and economy.

The main crankshaft and connecting-rod bearings in engines of this type must be fitted practically oil-tight. Any oil that can leak through the bearings will follow the crankshaft to the crank throw, and will be thrown up into the cylinders. The necessity of having oil-tight bearings presents a condition very difficult to meet with bearings designed to use shims. To prevent leaks, it is necessary that the two parts of the bearing be fitted solidly, metal to metal, and the caps bolted down solid, making an oil-tight joint where the halves of the bearing meet. Besides preventing oil leaks, this construction makes a more solid and rigid unit than is possible where shims are used, and, in connection with the oil-pressure system, helps produce a very durable engine. The oil being under pressure, the crankshaft is practically floated in the bearings.



Assembly View of the Boring Apparatus: The Bar, Working in Steady Rests, and Fed by a Lead Screw, Bores Out Each Bearing with a Tool Adjusted to Give It a Proper Finish Diameter

The approved practice in high-class engines is to make the bearing of bronze, bored large enough to allow facing with babbitt metal to form the bearing surface. The main and connecting-rod bearings must be fitted with an equal clearance around the entire circumference. The old practice of relieving them at the sides, so successfully followed with the splash system, cannot be followed with the pressure feed, as it would allow the oil to leak out of the sides of the bearing, causing an excess supply of oil at points that have been specially provided with oil leads to furnish the required amount. On bearings designed for the pressure system, the oil pocket is formed with a special tool, making a series of narrow grooves, with a strip of metal between each groove. These strips retain the bearing fit, forming a serrated oil pocket.

The factory, with special tools and jigs, meets the requirements of the system without difficulty. To the repair shop, however, the rebuilding and overhauling of this type of engine presents quite a problem, as more different sizes are encountered. The hand-scraping method of fitting bearings is a tedious job, and is seldom successful where the pressure system is used, since the scraper marks, extending through the end of the bearing, are apt to form a passage for oil to leak through.

The boring bar illustrated was built for repair-shop service, and is in constant use on a leading make of six-cylinder engine, having a seven-bearing crankshaft. It is found to produce work which meets the exacting requirements of the pressure system, retaining the original high efficiency of the engine. It works on the old boring-bar principle, so familiar to mechanics, and can be operated either by hand or by power.

One cutting tool is provided for each bearing. The method of adjusting the tools to bore out the bearing to exactly the proper size is illustrated in the insert of the second photograph. The tools are fitted into round holes made in the bar; these should be blind, so that an exact measurement can be made with a micrometer from the cutting edge of the tool to the opposite side of the bar. From

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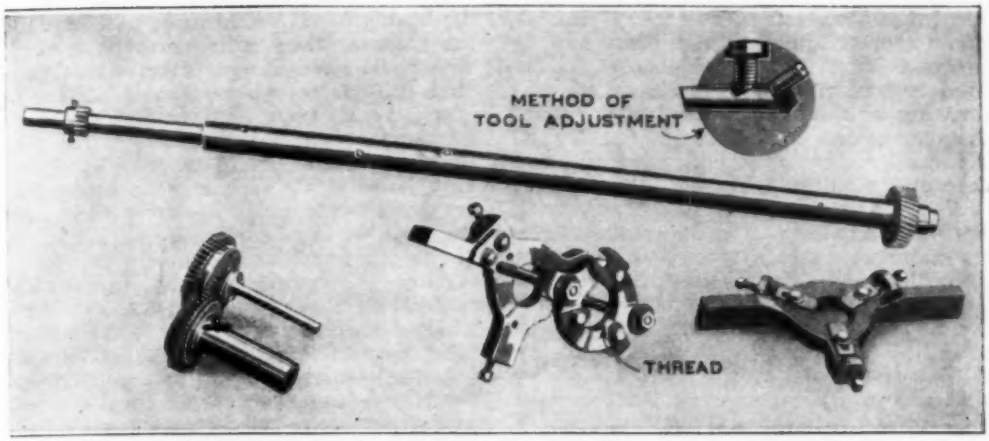
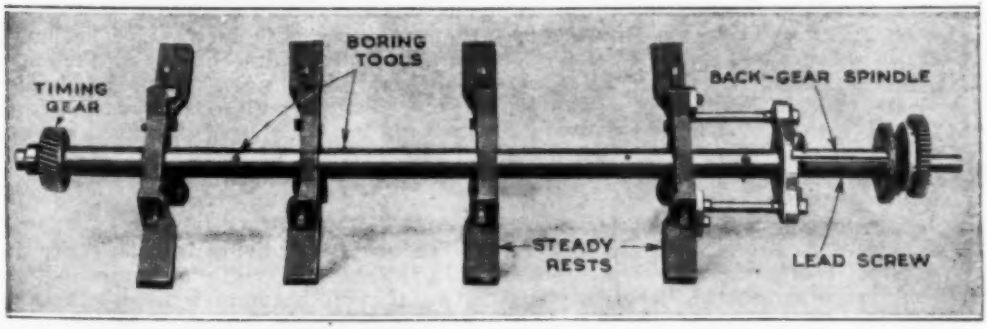


Exploded View of the Apparatus: Above Is the Boring Bar Itself, and in the Insert a View of the Tool Adjustment. To the Left, Below, Is the Train of "Back Gears" through Which the Lead Screw is Driven. In the Center is Seen the Built-Up Nut in Which the Lead Screw Works. To the Right Is One of the Steady Rests

this measured distance is subtracted the known radius of the bar, and the difference is the radius to which the bearing will be bored. If this is too large or small, the tool is adjusted by turning one of the two setscrews. Both of these work against beveled surfaces formed on the tool, and the desired adjustment is made by loosening one of the screws, and tightening the other.

The bar is fed through the cut with a mechanical feed of special design, which enables a fine-pointed tool to leave that highly burnished finish, so much desired in high-class work. A lead screw is cut on a sleeve, which fits over the bar, as seen in the third photograph. This sleeve makes a sliding feed on the bar, and turns in the same direction, at a reduced speed imparted to it by a train of gears. The internal thread in which the lead screw works is cut on the ends of three steel fingers, which project from a frame, shown in the center of the second photograph. This frame is fastened rigidly to the nearest one of the several steady rests, mentioned below. The pitch of the lead screw is 16 threads to the inch, and the train of gears gives a reduction of 9 to 1, so that the bar is fed 1 in. for every 144 revolutions.

Before boring out the bearings, the engine crankshaft must be carefully straightened and calipered with the micrometer; if it is found to be out of true, it must be reground, and the final diameters recorded for use in machining the bearings. To prepare the bearings for the reboring process, the bronze shell is rebabbitted, and the two parts are carefully matched and chucked in the lathe; they are rough-bored to a size that will leave sufficient metal for the finish-boring process. The oil pockets and grooves are cut, and the bearings fitted into the crankcase. Since the crankcase, being made of aluminum, is very easily sprung out of shape, it is advisable to turn up the



The Bar, the Steady Rests, and the Feed Mechanism in Position: The Spindle of the Back Gears is Extended, and is Held from Turning by a Dog, Attached to the Built-Up Nut. Four Steady Rests are Used in Working on the Six-Cylinder Engine

bearing-cap nuts to the proper tightness, and to mark them so that they can be brought back to the same point in the final assembly. It has been found that drawing up the bearing-cap nut the small distance of one cotter-pin notch, after the bearing has been finished, may spring the case and throw the bearing out of true.

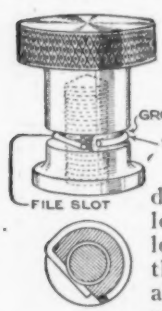
As seen in the first photograph, the boring bar is supported on brackets having adjustable steady rests, as in ordinary lathe practice. The front end of the bar is fitted with a standard timing gear, similar to the one on the end of the crankshaft. The boring bar is located, by means of the steady-rest adjustment, so that this gear meshes, with just the right amount of play, with the two large timing gears on the crankcase. The rear end of the bar is located by means of a slip ring, or sleeve, bored out to a sliding fit on the bar. The outside diameter of the sleeve is to fit the bearing, as rough-bored in the lathe; in practice, this end bearing will be roughed out to fit the sleeve which is to be used. The bearing is centered for rough-boring by reference to the bronze shell; this is located by the factory with sufficient accuracy to enable it to be used to find the correct center. Before starting the finish-boring, however, measurements should be taken with a depth gauge from the boring bar to the faces of the crankcase to which the cylinders are bolted. If the boring bar is found to be parallel with these faces, then it is correctly placed. The tools have already been set to produce the correct diameter, and the bar is now fed through, giving the finished bearing surface to the babbitt. After this boring operation has been completed, the only hand work necessary in fitting the crankshaft into place is that of relieving the ends of the bearings to fit the fillets of the crankshaft.

After the crankshaft has been finally assembled, the connecting-rod bearings, which have been accurately bored out in the lathe, are fitted to the shaft. An oil-pressure test, running up to a pressure of 50 lb. per square inch, is then applied. This figure is selected as compared with 35 lb., which represents the usual maximum working pressure. If no leak appears at the test pressure, the engine is ready for final assembly.

Besides the great advantage of eliminating the tedious process of hand scraping, the boring process has the advantage of alining all of the bearings very accurately with each other, resulting in a remarkably free-running engine. The boring method is found in practice to give a surface not inferior to that produced by reaming, and the equipment required is within the reach of any shop which does any considerable quantity of engine overhauling.

Nut Which will Not Come Loose

The sketch shows a simple means of producing a good free-acting tension on a knurled or other type of nut. It will stay put, and yet not be too tight to be removed without the use of a wrench. The wire has a spring temper, and fits into a groove in the nut. The groove must be a little wider than the diameter of the wire, to allow it freedom of action to locate itself in the groove of the thread. With such a wire, almost any tension desired may be had, by bending the wire before springing it into place.



¶A preventive of carbon troubles, which has been found successful, is to insert in each cylinder of the engine, about once a week, one tablespoonful of so-called solidified alcohol, while the motor is hot.

Restoring Lost Compression

When the thread in a cylinder head, into which the spark plug screws, is so badly worn that the plug can no longer be held gas-tight, the proper method of repair is by electric or oxyacetylene welding. When such facilities are not at hand, a practical repair can often be made by wrapping a piece of "paper brass," about .003 in. thick, about the spark plugs, and then screwing each in place. The brass should be cut accurately, so that the ends just touch but do not overlap, and should be coated with graphite and grease before screwing in. This repair has been known to give months of service.

Ash Can as Fire Extinguisher

The average individual is decidedly at a loss how to dispose of an oil stove when the oil becomes ignited. It is a question whether to risk a serious fire in the house, or to pick up the stove and throw it out of the house, perhaps getting

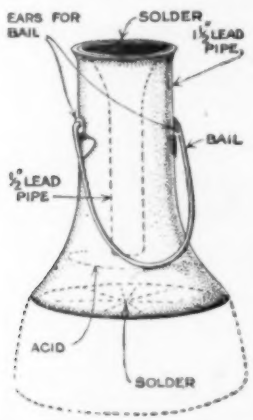
serious body burns in the process. In such an emergency one quick-witted person thought of a large, empty ash can in the cellar, and fetching it with all possible speed, turned it, upside down, over the stove. A few puffs of black smoke issued from under the can, but the blaze was effectually choked. The stove was permitted to cool before removing the ash can.—L. Halmer, Walton, N. Y.

How to Make Abrasive Stones

A mixture of cement and emery, carborundum, or other abrasive, is easily molded into sharpening stones of any desired shape. By varying the proportions of the ingredients and using abrasive material of different fineness, almost any grade of sharpening stone is produced.

Nonspilling Acid Container

A container for soldering acid, or other liquids, that will not break or spill its contents when upset, will be found a decidedly convenient addition to the shop. Such a container is made from a short piece of 1¼ or 1½-in. lead pipe, which is expanded broadly at one end, as shown by the dotted lines. The bottom is then drawn together, and the openings filled with solder. A piece of ½-in. lead pipe is similarly expanded at one end, and soldered into the top of the larger pipe, as shown. Small ears for a bail, or handle, are soldered to the side, which completes the container. Such a container is unaffected by acids, and can be turned or upset at any angle without its contents spilling.

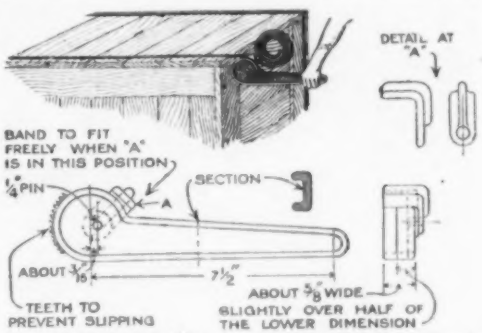


Worn Rubber Converted into Foothold

It is usually the case that a woman's rubber wears through at the heel while the rest of it is still in good condition. By cutting off the heel, so that a strap is formed to fit over the back of the shoe, the overshoe can be converted into toe rubbers, or footholds.—R. H. Metzelfeld, Milwaukee, Wis.

A Band and Wire Stretcher for Packers

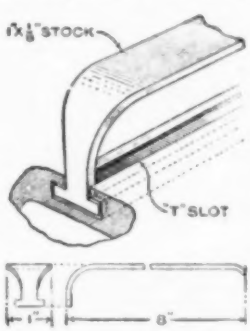
In tightening up the steel plates around packing boxes, much hard labor can be saved by using a tool such as illustrated. The band is wedged between the handle and the part A. This piece is pivoted on the main piece or lever, at a point to the right of the center, and has such a curvature that when the lever is brought down, the band is tightly clamped. Pressing the lever still farther down tightens the band around the box, and it can be nailed while held in this position. Teeth may be formed on the end of the lever, as shown, to prevent slipping, but if the surface of the lever is fairly rough, they are not really necessary.—Henry G. Appleblad, West Haven, Conn.



The Hard Hand Work of Stretching Steel Bands around Packing Boxes is Eliminated by the Use of This Tool

Tool for Cleaning T-Slots

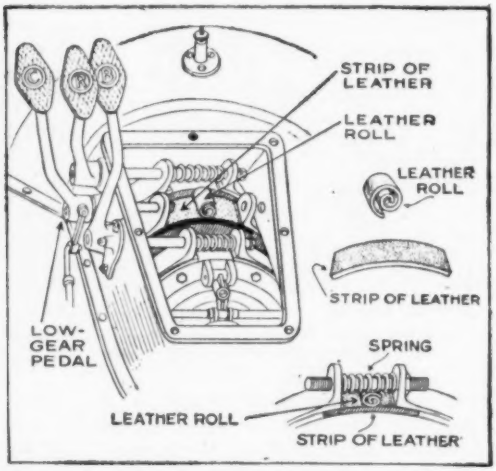
The time wasted in cleaning out T-slots of a planing or milling machine will be saved by the use of the tool illustrated, which can be made from a scrap of iron in a few minutes. The end that fits into the slot should be made about 1/32 in. smaller than the dimensions of the slot, so that it can be pulled freely along the table of the machine. By turning the tool at right angles, it can be removed or inserted at any point in the slot.—Harvey Mead, Scranton, Pa.



¶ When filing solder, a little machine oil will prevent the teeth from clogging.

Repair for Auto Low Gear

When the low-gear friction band, on a popular light automobile, burns out after a long pull, it will be found practically impossible to get the clutch into high gear. When such an emergency occurs, a temporary repair, that will hold for several days, or until permanent repairs can be made, is easily effected.



Strips of Leather, or Heavy Canvas, Make It Possible to Get the Light Automobile into "High" When the Low-Gear Friction Band Burns Out

The cover of the transmission case is removed with care, so that the gasket will not be broken. The band-adjusting screw, on the outside of the transmission case, is unscrewed until the low-gear friction band is released from friction. A strip of leather, from a heavy shoe, or a piece of thick, tough canvas, is inserted between the low-gear band and the drum, as shown in the drawing. Another strip of leather, or heavy cloth, 2 or 3 in long, is rolled up and inserted between the coil spring and the flat leather band, in the manner indicated. Tightening the adjusting screw, until the low-gear friction band is nearly tight, and replacing the transmission cover completes the repair. —Leo C. Shinn, Portland, Ore.

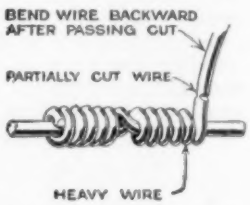
Mixture for Cleaning Windshield

Equal parts of alcohol and glycerin form a fairly well-known compound to keep the windshield and glass of an automobile free from moisture and water during rainy weather. However, few take the trouble to purchase and mix the ingredients in preparation for rain.

Small tins of "solidified alcohol" afford a very satisfactory means of combating the blurred windshield. Simply apply it with a piece of rag over the surface of the glass. The material contains a little paraffin or waxy oil, perfectly transparent, that sheds the water as well as the above-mentioned alcohol and glycerin.—G. A. Luers, Washington, D. C.

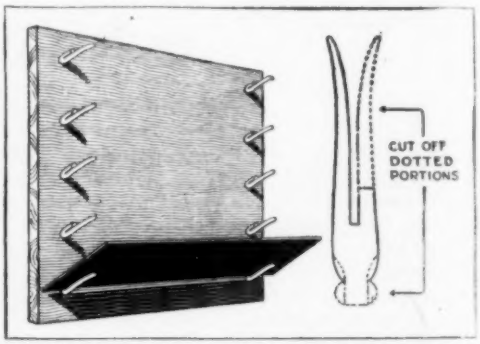
Splicing Heavy Wire Smoothly

In splicing a stiff wire with the type of splice illustrated, difficulty is often experienced in getting the ends of the coils to lie tight against the straight wire, thus making a smooth splice. One method of getting such a splice is to leave the ends of the wire long, notching them, as illustrated, at a point which represents the proper length for splicing. The wire is then wrapped a half turn past the notches, and when the extra ends are broken off at the notches, the rest of the wire will not be disturbed.—Thos. L. Parker, Wibaux, Mont.



Show-Card Drying Rack

Freshly lettered show cards can be dried in a rack made from a few clothespins and a small board. Slanting holes are bored near the ends of the latter at regular intervals. One prong of each pin is cut off at a point ½ in. from its attached end, and the heads are trimmed with a sharp knife. The pins are inserted in the board as shown in the drawing. Two of them serve to hold a card.—Arthur J. Kelly, Brooklyn, N. Y.



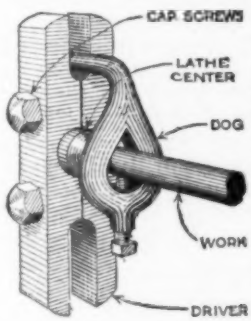
Rack for Drying Show Cards: Clothespins, Cut as Indicated, are Inserted in Slanting Holes in a Board

Triangle with Irregular Curves

The artist, or draftsman, who is handy with a jackknife or a file can turn an ordinary solid triangle into one which is useful also for drawing irregular curves. If a scroll saw is available, the work can be simplified, but a jackknife for the wooden triangle, or a drill and file for a transparent composition triangle, will make the work possible without the scroll saw. The form of the outlines to be cut in the triangle should be governed by the nature of the curves which the workman ordinarily encounters.

Driver for Small Lathe Dogs

In doing small lathe work held on the centers, the tail of the dog is often too short to reach the slot in the driving blade. In such a case it is possible to put a stud in the driving plate, or to put another dog on the lathe center, but both these methods are objectionable as being likely to throw the lathe out of balance at high speeds. Also, there is lost motion amounting to one complete revolution whenever the lathe is reversed—unless the tail of the dog is fastened to the stud, or tail, of the other dog. This can be done with a piece of string, or wire, but considerable time may be lost by such methods.



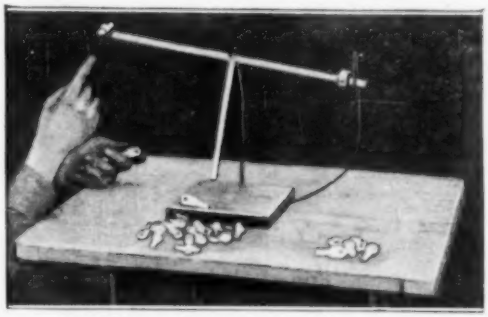
The driver, shown clamped on the lathe center in the illustration, was designed to handle a big job of this kind of work. It is made of two pieces of mild steel put together with screws, and bored through the joint to a diameter .005 in. smaller than the center, so that it can be clamped on tightly by turning the screws. The two slots in the end, which should preferably be of different sizes to accommodate various dogs, are milled, after drilling out part of the steel.

The driver does not mar the lathe center as would the setscrew of a dog. It is neater and more satisfactory in every way.

¶A mixture of four parts sodium fluoride and one part pulverized sugar is very effective in destroying ants.

Aluminum Castings Tested by Weight

A difficulty in the use of small aluminum castings is that air bubbles, which may have formed on the inside, greatly

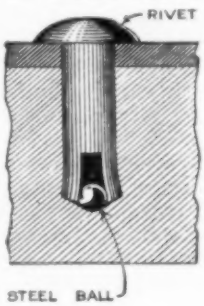


Perfect Aluminum Castings are Distinguished from Those Having Air Holes by Testing for Weight with a Special Balance

reduce the strength of the finished part. A factory which uses a great many such castings employs the balance illustrated for determining whether a casting is free from air bubbles or not. The balance is first adjusted so that the weight of a perfect casting is just sufficient to tip the beam, while a defective casting containing an air hole is too light to do so. The method is quite rapid, and sufficiently accurate to give reliable results.—John Edwin Hogg, Los Angeles, Calif.

Tight Rivets in Blind Holes

The riveting of a plate to a body is often a tedious job. The sketch shows how a rivet can be fastened securely in a blind hole. Before the rivet is inserted, a hole is bored in its end, and a steel ball dropped into the blind hole. When the rivet head is hammered, the ball is forced into the hole in the rivet, expanding the latter and seating it firmly.



Compressed Air Cleans Tobacco Pipe

An easy way to clean a pipe is to hold the end of the pipe stem against the valve of a compressed-air tube, such as is to be found in nearly every garage. When one is on the road in a car, the valve of one of the tires may be used for the same purpose.—Robert C. Knox, Rogers, Ark.

Worn Shirts Made "Good as New"

Many a fine shirt is discarded when the usual method of careful patching has failed to mend the holes worn by the edges of the collar, without showing the patch too plainly. To avoid this waste, lay the shirt out flat on a board, bosom up, and smooth out the front. Using a rule, mark a line with a pencil, or marking chalk, thus:

A Shirt Which has been Badly Torn by the Edges of the Collar can be Made Almost as Good as New by a Little Alteration on the Bosom

Starting from the shoulder strap, mark straight down the front of the shirt, about 1 in. in from the armhole seam, on both sides of the shirt, following the stripe of the cloth, if any. If the cloth is plain, follow the weave. Then make a mark on the bosom, on both sides, parallel with the front of the collar band and the front edge of the shoulder strap; this mark should be about ¼ in. below the worn places in the bosom, to allow for hemming.

Next rip the front seam of the shoulder strap and the front seam of the collar band. Cut along the lines made on both sides of the shirt front, from the lower end of the shirt up to the shoulder strap. Also cut across the bosom, about ¼ in. above the mark, leaving this ¼ in. for seaming in. The torn part of the garment has now been entirely removed. Move up the whole front of the garment, until the lines across the front come to the collar band and the shoulder straps; with the sewing machine run up the long seams on either side of the garment, taking care that the button holes match the buttons down the front. Then baste the upper ends of the bosom into the collar band and shoulder straps. If desired for the sake of appearance, the lower ends of the garment may be evened off, so that there will be no difference in the length of the front and sides. The long seams at the sides, being under the vest, do not show, and the garment has all the appearance of being new.—M. V. Tessier, Nyack, N. Y.

Pail Forms Chimney-Pipe Hole

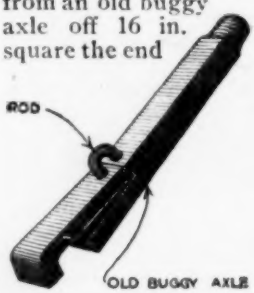
A metal-lined stovepipe inlet for a brick chimney is provided by placing an ordinary straight-sided tin pail of the proper diameter in the flue wall at a convenient point. After the bottom and bail have been removed, the pail is set in the chimney with its top flush with the outside surface of the wall. When the inlet is not occupied by a stovepipe, as often is the case in warm weather, it can be closed with the lid of the pail.—L. M. Jordan, Wallace, Ala.

Splice for Surveyors' Tape

To repair temporarily a surveyor's chain, or a tape broken during the progress of work in the field, cut from a softwood sapling, a piece about 6 in. long and ⅝ in. in diameter. Split this piece on a diameter, place the two broken ends in the split, and wrap the whole tightly in tough, small cord. Then place the splice in water for about 15 minutes. It will take much more than the usual pull on a chain to cause the broken ends to part.—Richard F. Lufkin, Charleston, W. Va.

Homemade Buggy-Tire Puller

A tire puller, useful for removing steel tires from buggy wheels, can be made from an old buggy axle. Cut the axle off 16 in. from the ends; square the end and split with a hacksaw for 5 in. Cut off part of one of the sides thus formed; forge the other one over, and cut it entirely off as shown. Drill holes and run in a staple made of stout iron rod; rivet the ends on the opposite side. The tool will work well on either buggy or wagon tires. The tire is of course gripped between the forged tip and the sawed-off end, and the other end of the tool forms a lever for working off the tire.



Some Modern Methods in Live-Stock Corral Construction

By H. A. SHEARER

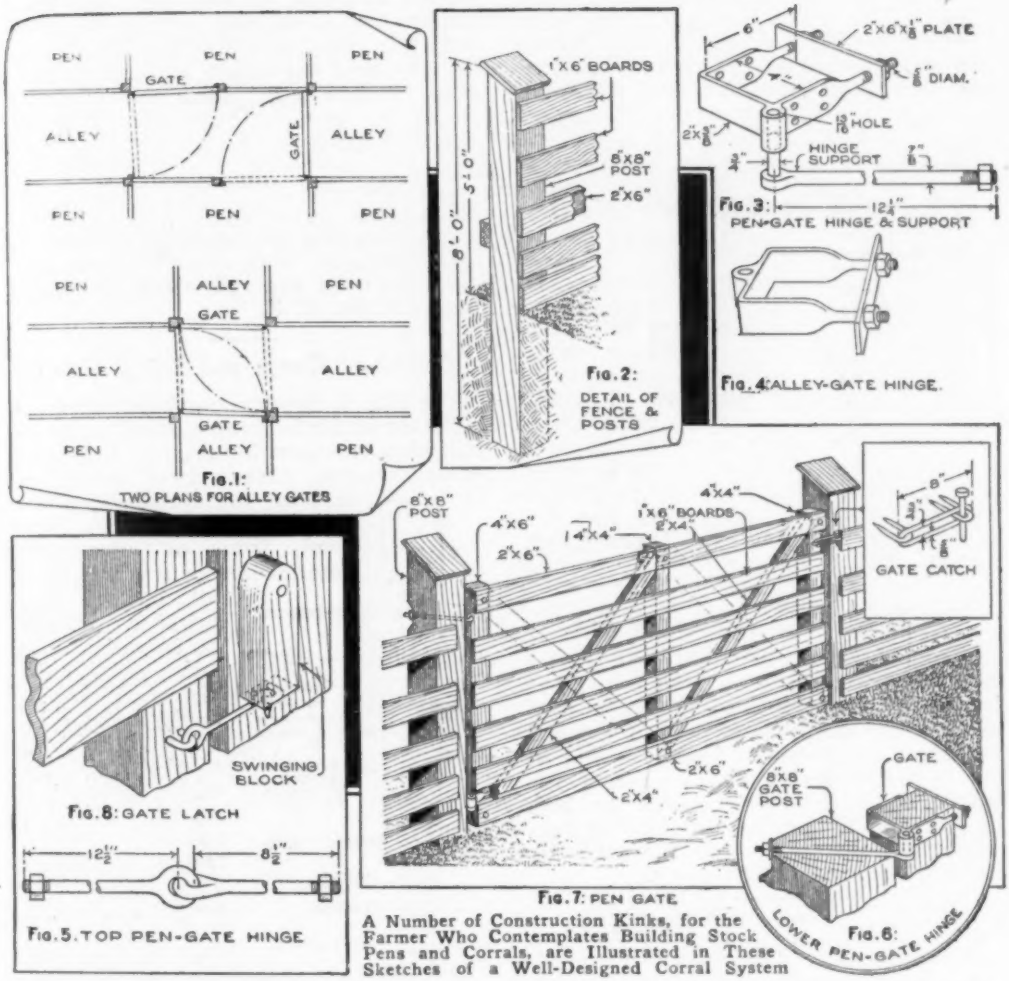


Fig. 1: TWO PLANS FOR ALLEY GATES

Fig. 2: DETAIL OF FENCE & POSTS

Fig. 3: PEN-GATE HINGE & SUPPORT

Fig. 4: ALLEY-GATE HINGE.

Fig. 5. TOP PEN-GATE HINGE

Fig. 8: GATE LATCH

Fig. 7: PEN GATE

Fig. 6: LOWER PEN-GATE HINGE

A Number of Construction Kinks, for the Farmer Who Contemplates Building Stock Pens and Corrals, are Illustrated in These Sketches of a Well-Designed Corral System

PENS and lanes to control hogs, cattle, and horses must conform to the old specifications, "hog-tight, horse-high, and bull-strong." Modern requirements also demand convenience and labor-saving features as well as safety for man and beast.

The drawing shows some of the latest and most approved methods of laying out the corrals, lanes, and cross lanes; also methods of constructing the fences and gates to hold the animals in their respective pens, and to facilitate their removal to or from the loading chutes, or other places of transfer.

Valuable animals must be securely controlled, but they must also be gently handled. The present high value of domestic animals fully warrants the necessary outlay, and a satisfactory profit is almost certain if the construction cost is proportional to the amount of business transacted.

Referring to the illustrations, Fig. 1 gives suggestions in regard to layout of the pens and alleys, together with the system whereby one pair of gates is made to control the animals both in the pens and in the alleys. The detail drawing, Fig. 2, shows how the corral fences are built of heavy posts with boards running horizontally.

Figure 3 shows a heel-strap hinge, with the eye at the corner. This hinge is used on lane gates that open back against the fence. Fig. 4 is the same kind of box-strap hinge, except that the eye is made opposite the center line so the gate will swing both ways, to open or close either a pen or lane as illustrated in Fig. 1. Figs.

5 and 6 show the upper and lower gate hinges, the former made of two heavy eyebolts linked together. Fig. 7 shows the construction of the heavy gates, and the way they are hung and fastened—also a very satisfactory type of fastener. Fig. 8 is a safety button that prevents snoopy cattle or mischievous colts from lifting the hook with their noses or tongues. The button hangs from a bolt directly over the staple, as shown. It is easily pushed aside when the attendant wants to open the gate, but cannot be operated by the animals.

Front-Axle Stand for Automobiles

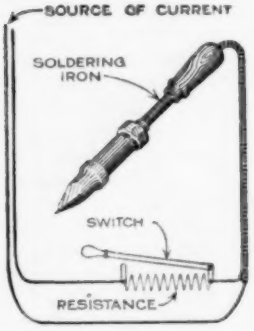
The front axle of a car may often be supported more satisfactorily than on an ordinary jack, by the use of a prop made from a section of an old rear-axle housing, cut off to include half of the enlarged, or central, part.

To Drop Medicine into the Eye

When it is necessary to drop medicine into the eyes unaided, this method has been found satisfactory: Slipping a cord through the supporting prop of a stand mirror, fasten the cord from one end of the bedstead to the other, so that the mirror hangs face down over the bed. By lying on the bed underneath the mirror, it is possible to drop the medicine into the eyes without difficulty.

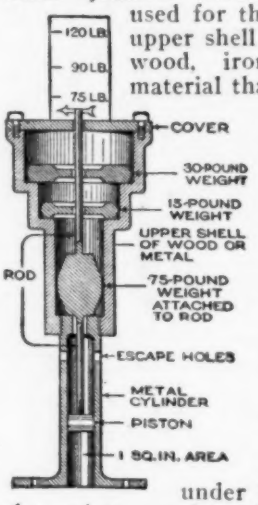
Keeping Electric Soldering Irons Ready for Use

To prevent an electric soldering iron from overheating while not in use, and at the same time keep it at the right temperature for work whenever needed, a resistance coil and a switch should be installed, as indicated in the sketch. When the iron is being used, the switch is closed, cutting out the coil, and permitting a full supply of current to reach the tool. As the irons vary considerably in size and current consumption, no fixed rule can be given as to the amount of resistance necessary, but this can be easily ascertained by experiment. Iron or nickel-silver wire is suitable for the coil.—Van Allen Lyman, Balboa, C. Z.



Combined Gauge and Safety Valve

The sketch shows a combined pressure indicator and safety valve, suitable for installation on steam boilers, air tanks, and water systems. Strong metal should be used for the cylinder, but the upper shell can be made from wood, iron, or any other material that is available. The interior of the cylinder should be smoothed in a lathe, so that the piston will fit perfectly in all positions. If the area of the lower end of the piston is 1 sq. in., and if the rod and its attached weight have a combined weight of 75 lb., it will require a pressure of 75 lb. under the piston to raise the rod to a point where the arrow will rest on the 75-lb. mark of the scale. When the pressure reaches 90-lb., the 15-lb. weight will be lifted by the rod, while the 30-lb. weight will be added to the load when the pressure reaches 120 lb. In case the pressure exceeds 120 lb., the piston will be forced past the escape holes, and held there until the pressure falls below that point. If the area of the end of the piston is doubled, the weights should be twice as heavy to indicate the same pressure.



The device can be constructed to show larger or smaller increases in pressure by varying the size of the piston and weights. The cover should hold the rod firmly in an upright position, as otherwise the piston may stick in the cylinder.—James E. Noble, Portsmouth, Ont., Can.

Delivery by Toy Wagon

Discovering that patrons were buying bulky articles, such as potatoes and flour, from stores having delivery systems, the proprietor of a "cash-and-carry" grocery purchased a number of toy wagons, and placed them at the disposal of his customers, who use them in taking home heavy and unwieldy packages. The wagons are placed near the door of the store, and on each is painted this information: "Use me when you need me, but bring me back." A small charge is made when the vehicles are not returned promptly, but none under other circumstances. The plan has proved quite popular with customers.

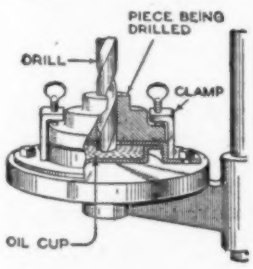
Canvas Shoes for the Farmer

In wet weather, when a farmer, or any other outside worker, finds it necessary to make a short visit into the house—for instance, to answer the telephone—a pair of canvas sacks will be found very convenient. These can be made to go easily over the shoes, with rubber bands at the top to prevent their slipping down.

The sacks can be kept clean, outside the house, and will prevent dirt from being left in the house.

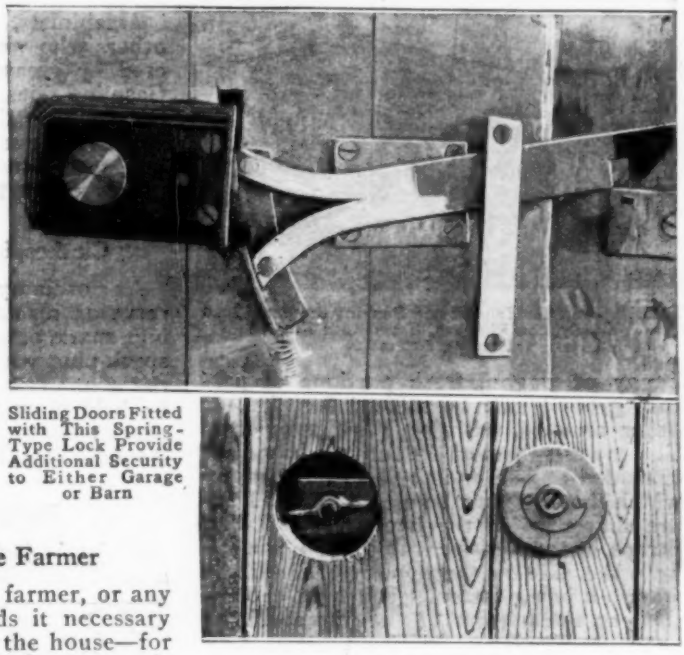
Jig Makes Drill Self-Oiling

Having a number of pieces to be drilled, similar to the one illustrated, I made a jig of such design that the point of the drill, on lubricating one piece of work, takes up oil, to be used in drilling the next piece, from a cup built in the jig. It takes no longer to remove and insert the work than when using an ordinary jig of this type, and the work of oiling the drill is saved, besides insuring that the drill will always be lubricated as long as the cup holds oil.



Spring Lock Used on Sliding Door

Usually applied only to swinging doors, a spring lock may be fitted to rolling or sliding doors, such as used on barns and garages. This is accomplished by means of a lever, somewhat like a common latch. In locking, the latch is operated from the outside by a wing nut, on a pivot bolt at about the center of the lever. When the latch end is lowered so as to catch, the other end rises, permitting the bolt of the lock to engage in the notch provided for it, and locking the door. A coil spring pulls the lock end of the lever down the instant the key turns back the bolt of the lock, thus freeing the latch and permitting the door to be opened.—Alva H. Pulver, Sodus, N. Y.



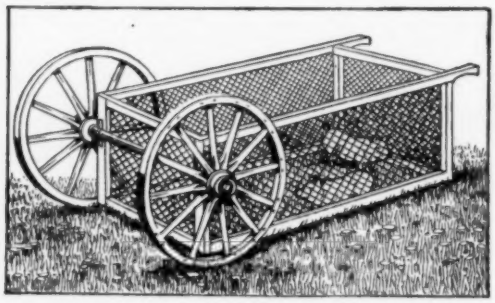
Sliding Doors Fitted with This Spring-Type Lock Provide Additional Security to Either Garage or Barn

Holding Square Wire in Chuck

When a small square shank, or piece of square wire, is to be gripped in a lathe chuck for turning, and it is necessary to use a three-jaw universal chuck, a very handy kink is to wind some copper or brass wire around the square metal. The three-jaw chuck will take a grip around the wire which, although it may not hold the square section absolutely concentric, will center it with sufficient accuracy for most purposes.—J. F. Brennan, Kingston, Jamaica.

Movable Pen Makes Available Fresh Feeding Ground for Young Stock

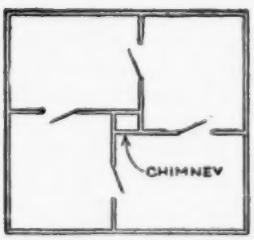
By providing a light runway with an axle and two wheels from a discarded



By Lifting on the Handles and Pushing the Pen Ahead Slowly, the Pigs are Moved to a Fresh Feeding Ground

buggy or wagon, fresh portions of pasture ground may be utilized for pigs, or other animals, with little inconvenience. The top members of the runway frame are extended at one end to form handles, by which that end may be easily lifted. They are shaped to fit the hands comfortably. Straps of light-gauge iron may be used to hold the axle to the opposite end of the frame, it being fastened just high enough to keep the bottom of the frame off the ground. The runway itself may be covered with wire netting, or may be made in any way to suit the owner. It is a matter of only a few minutes to lift the runway by the handles and push it ahead to some fresh place, without disturbing the animals while the move is being made.

Invisible House Chimney



The drawing shows how a chimney may be placed in a house, so that it does not protrude in any of the rooms, thus eliminating objectionable extra corners.

To Test a Job of Door Hanging

A good test to apply to a door after it is hung is to close all doors and windows in the room on the other side, and then try to slam shut the door to be tested. If the door refuses to close with a bang, owing to the cushion of air, but can then be closed easily by a slow, gentle pressure of the hand, it is a fairly sure indication that it has been hung in a skillful manner.—Willis E. Berg, Berkeley, Calif.

Carbon Tetrachloride Cleans Goggles

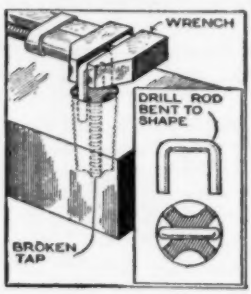
Machinists, mechanics, airmen, and others who wear goggles, are often bothered by grease collecting on the lenses. Gasoline does not clean it off perfectly, because this liquid itself has a tendency to leave a greasy residue on glass. Carbon tetrachloride, a grease solvent, removes every trace instantly.

Clothespin as Insulating Pliers

An ordinary wooden clothespin will serve as insulating pliers when automobile spark plugs are tested. A detached spark-plug wire is pushed into the slot in the pin. The end of the wire can then be held close to the spark-plug binding post without danger of shock.—A. D. Bonfils, New York City.

Broken-Tap Extractor

A simple device for removing taps from material in which they have been broken



off is made by bending a piece of drill rod into a "U." The ends of the rod are placed in opposite flutes of the tap, and a monkey wrench, fitted on the projecting portion of the "U," is employed to turn the imbedded tool. To facilitate the operation, small cuttings should be removed with an air blast or a magnetized rod, and oil should be squirted around the tap.

Hints for Home Builders

The following pointers are offered to enthusiastic but uninitiated home builders by an architect of many years' experience:

Warm walls save coal.

A bungalow costs more than a house of the same cubic contents.

It isn't the nickel on the plumbing that denotes good fixtures.

A cold house is not a matter of chance, but of bad building.

It isn't the size of the furnace that

makes heat, but the size of its heating chamber.

If your purse is slim, remember that every cubic foot you build costs just so much to build, clean, and heat.

The cost of a servant's wage and keep for one year will buy many labor-saving devices for the home.

Figure out what the spare room costs to build, heat, and clean—to furnish, to insure, and to pay taxes on; then figure how often it will be used—you may build it!

Keep something in hand for the grounds around the house; the setting has a lot to do with the appearance of a house.—H. E. Lloyd Owen, Port Arthur, Ontario.

Paper Plate under Paint Can

A paper plate, of the sort used for picnics and for holding small pies, can be put under a paint can to prevent the drippings from soiling the floor. What paint does escape down the sides of the can, serves to keep the plate in place when the can is picked up. This use of paper plates has been found especially handy with paint pots used for "touching up" automobile bodies.—Jas. W. Cottrell, Hammonton, N. J.

Bellows for Cleaning Furnace

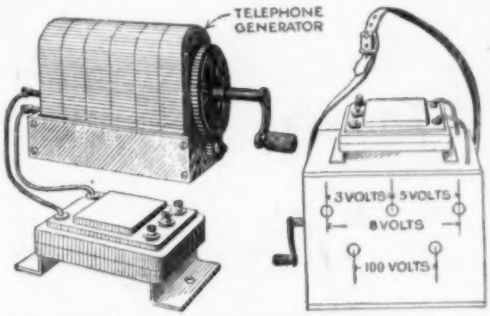
To clean out the furnace, between the inside walls, I used a 3-ft. piece of garden hose, placing it on the end of a small bellows. The hose can be pushed into all the nooks and corners while an assistant operates the bellows. The idea may help the many who know no other way of doing this work than with wires and brushes.—Geo. Veldman, Grand Rapids, Mich.

Enforcing Careful Driving at Corners

To discourage fast automobile driving around dangerous curves in the vicinity of country towns, the following method may be found effective: Pile cinders, about 1 ft. high, all the way across the road. This pile should be about 15 ft. from the curve, so that in slowing down for the bumps the driver slackens the speed at which he takes the turn.—Edwin Dick, Ocean Springs, Miss.

Telephone Generator for Electrical Testing on Automobiles

In locating grounds, shorts, and open circuits, I have found the instrument



A Small Testing Set, Made Up of a Bell-Ringing Transformer and a Telephone Generator, Is Useful to the Mechanician

shown very cheap and useful. It consists of a telephone generator, or magneto, which develops alternating current at about 100 volts, connected to a bell-ringing transformer, which transforms the 100-volt current to three, five, and eight volts. I have thus four different tensions which can be used when required. For testing insulation and locating short circuits, I use the 100 volts direct, completing the circuit with the fingers. That is, instead of connecting both wires to the leads of the instrument, I hold one wire in the hand and press the finger on the lead; a very slight current can thus be felt. For testing bells, low-tension coils, etc., either the three, five, or eight-volt current is used.

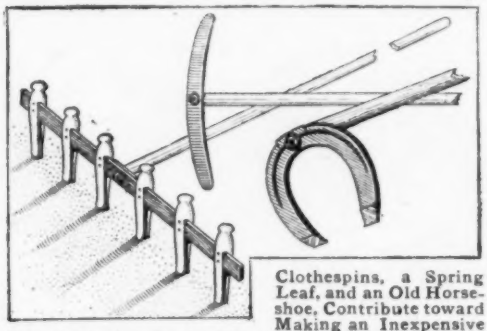
The magneto is fastened inside of a wooden box, and the transformer on the cover. Connections between the magneto and transformer are made on the inside, all terminals having a lead outside for connection. A leather strap is fastened to the box for carrying.—Jos. Magis, Ouffet, Belgium.

Sawdust for Plugging Holes

When it is found desirable to use an old board, the following method may be employed to fill up nail holes in its surface: Saw a small piece off the end to get a supply of sawdust from the same board. Mix the sawdust with a little glue, and fill in the holes with the mixture. When dry, sandpaper the board down even, and it will be almost impossible to find where the holes were.—John Madlena, Standard, Ill.

Homemade Garden Tools

From odds and ends readily available to almost anyone, substantial and satisfactory garden tools are easily made. A

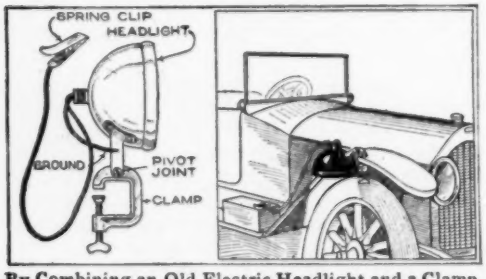


Clothespins, a Spring Leaf, and an Old Horseshoe, Contribute toward Making an Inexpensive Set of Garden Tools That Answer Their Purpose Admirably When Regular Tools Are Unobtainable

leaf from an old spring, attached to a handle, as shown, makes a good grub hoe or a pickax, when the ends have been sharpened by filing or grinding. An old horseshoe, sharpened at the heels and attached to a handle, makes a good cultivator. The row marker illustrated is made from a lath, nailed to a broom handle, and a few clothespins.—C. A. Black, Jr., Hightstown, N. J.

Adjustable Auto Trouble Lamp

A handy detachable trouble lamp for automobiles can be made from a discarded electric headlight and a clamp of



By Combining an Old Electric Headlight and a Clamp, as Shown Here, a Handy Trouble Lamp for Automobiles can be Made

the type illustrated. The headlight bracket is attached to the clamp by a small bolt that is passed through holes of suitable size in both pieces. This provides a joint which permits the position of the lamp to be changed when the device is fastened to a fender, or some other part of a car. If the car has a grounded electric system, one of the wires leading to the light bulb is grounded on the lamp, while the second is fitted with a metal clip for attaching it to a "live" point on the wiring system. With a double-wire system, clips should be fastened to the ends of both wires. This lamp is very convenient when it is necessary to make repairs at night, as it can be attached in an instant wherever it is needed.

Driving Nails in Cement

Cement would be used in many places, were it not for the difficulty of driving nails into it so that they will hold. If clean cinders are mixed with the sand and cement, the surface will hold a nail almost as solidly as wood. It is suitable for fence posts and places for driving nails in basements.—A. Handelman, Montreal, Que., Can.

Grain-Bag Holder Protects Bag

A means for attaching a grain bag to a chute without the use of hooks, which tear the bag, is shown in the accompanying drawing. A channel, 1 in. wide and ½ in. deep, is cut near the bottom of the chute. When the bag is bound to the chute with a heavy strap, which fits in the channel and is buckled tightly, it can be filled. To remove the bag, simply unbuckle the strap. If it is desired to use a stand holder, a section of a chute, provided with a channel, can be mounted on legs.

Street Signs Cheaply Obtained

Street signs made from old automobile-license tags, donated by local car owners, are serving satisfactorily in a small middle-western town. The reverse sides of the tags are painted white, and lettered in black. The inexpensive guides are nailed to telephone poles at street intersections.—Mrs. George Katzenmeyer, Bowling Green, Ohio.

¶A large spring cotter may be converted into a serviceable pair of tweezers by grinding the open end to a point. Before grinding, wrap the cotter with a string near the eye, tight enough to close the open end.

Amateur Mechanics
Information as to where to obtain any specified materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

How to Make Rag Rugs at Low Cost

By BESSIE L. PUTNAM

HANDMADE rugs find place in some of the finest metropolitan homes, yet any woman with a little spare time and several worn-out dresses can have one equally good at a trifling cash outlay.

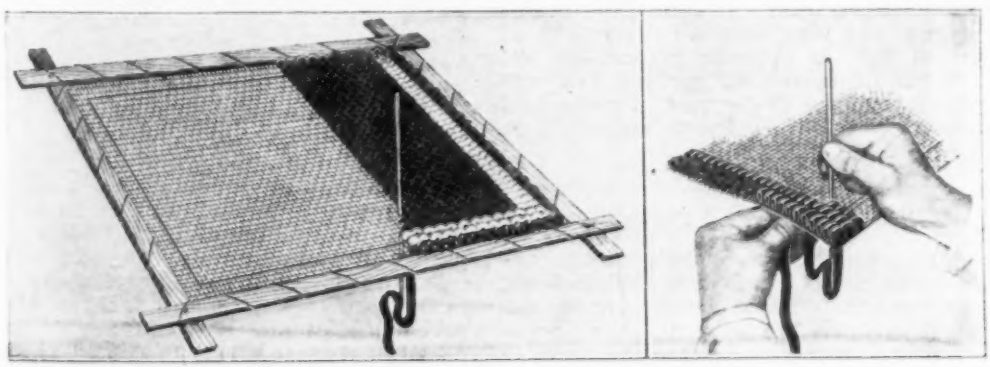
The materials necessary are four light strips of wood for a frame—lath will answer the purpose; some half-worn cashmere, serge, or other wool or half-wool dress goods; a piece of good burlap, 2 in. larger each way than the finished rug; a strong, sharp-pointed wooden hook, and a wire brush with sharp points.

Nail the strips together to form a frame of the same size, measured inside, as the rug to be made. Baste a hem, 1 in. wide, around the edge of the burlap, which is to form the base of the rug. If a conventional design or landscape outline is desired, sketch this on the burlap with ink or colored crayon. If not artistically inclined, one may still have a handsome rug by marking a straight border of one or two colors, and filling in the main part of the rug with mixed colors, or mixed shades of brown, or some other soft color harmonizing with the border.

Fasten the burlap into the frame with strong wrapping twine, after the manner that our grandmothers fastened quilts into the frame for quilting. Cut the strips of cloth ¾ in. wide, making them crosswise of the cloth if the warp is cotton, so that the cotton threads can be removed, as explained later. They may be of any convenient length, from 3 in. up. Do not bother to sew them.

The burlap, in its frame, may be supported, for convenience, upon the backs of two chairs. Commence at any desired point, though the border is most commonly worked first. Hold the end of a strip between the thumb and forefinger of the left hand, under the burlap. Put the hook through from the upper side at the desired point. Draw up through the meshes of burlap the end of the strip of cloth, leaving it a little less than 1 in. in length. Again press the hook down through the burlap, about two or three threads in advance, and draw up the working strip, leaving a loop, about ¾ in. high, on the upper side. Continue hooking down through to the strip of cloth carried underneath in the left hand, until it is entirely worked up into loops, leaving the last end on the upper side. About two—and never more than three—threads are left between each loop, this making the loops so close together that they rarely pull out.

Continue with other strips in the same



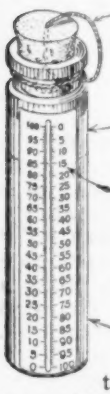
At the Left is Shown the Wooden Frame, or Loom, to Which the Burlap Base is Attached, and the Manner of Using It; to the Right Is a Sample of the Work, with Some of the Loops Still Uncut

manner, and when the row is finished, cut the loops. Make other parallel rows in the same way, two threads from the last made. Outline any conventional design in some pronounced color, and fill in with the chosen ground color.

When the entire piece of burlap is filled in and the loops cut, even off the work with shears if necessary, and then comb with a sharp wire brush; or better, make a comb by sticking pins into a strip of firm duck, just as they are fastened in the paper by the factory, but a little closer together. Clamp the heads between two strips of leather, and use as a comb to remove any cotton threads in the warp, and obtain the plushlike effect. Well made, these rugs will last for years.

Cream Gauge Made from Bottle

By keeping a record of each cow's production of cream, the farmer is enabled accurately to ascertain the productive animals of his herd. In the absence of other means of testing, a satisfactory cream gauge can be made from a tall bottle, or test tube, which should be 7 or 8 in. long. A strip of paper is cut, about 1 in. wide and long enough to reach the shoulder of the bottle. An open slot, ⅛ or ¼ in. wide, is cut in the center of the strip, as shown. Beginning at the top on one side, the open space is divided into 100 equal parts, marking them 5, 10, etc. On the opposite side of the slot, the same number of graduations is made, but beginning at the bottom.



To use the tester, the milk—as fresh as possible from the cow to be tested—is thoroughly stirred, and the bottle filled with it level with the top marks. The bottle is then tightly corked, placed upright in a jar of cold water, and allowed to stand in a cool place for about 10 hours, when the proportion of cream to milk is easily read off. The scale beginning at the top gives the percentage of cream and the opposite graduations the amount of milk. An average cow will give from 10 to 15 per cent of cream and a good cow, 20 per cent or more.—N. P. Lewchuk, Canora, Sask, Can.

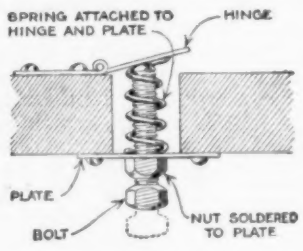
Portable Reflector for Camera Work

One of the first elements of photography is to get detail into the shadows, and without a suitable reflector on the "dark" side of the subject to be photographed, most, if not all, of the detail is lost in excessively dark shadow.

To make such a reflecting screen, it is only necessary to provide an ordinary window shade of the desired size and coat it with aluminum paint. It will ordinarily give an increase of about 25 per cent in photographic efficiency, and has, besides, the advantage of being easily rolled up for carrying.

Hinge Forms Adjustable Bench Stop

A bench stop that will not be so much in the way as the ordinary stop, when a clear bench is desired, is easily made. A hole, about 1 in. in diameter, is drilled at the desired point, and a square hinge is screwed over it, allowing the joint of the hinge to come a short distance away from the edge of the hole. Solder a ½-in. nut to a metal plate, or large washer, and fasten it to the underside of the bench, directly under the hole, so that the bolt projects through the center. By turning up on the bolt, the hinge is raised above the surface of the bench and acts as a stop. Unscrewing the bolt, the hinge is pulled back into place by a light spiral spring, which is attached to the hinge and the metal plate, and through which the bolt passes.—L. B. Robbins, Harwich, Massachusetts.



Carbon Paper Makes Blueprints

Small blueprints may be made without a tracing, by placing an unused sheet of carbon paper between two sheets of fairly thin paper, and the whole on some smooth, flat surface. The drawing is made on the top sheet, with a sharp, hard pencil, and should any lettering or explanation be necessary, the three sheets may be placed in the typewriter. When the sheets are separated, and the carbon

paper held to the light, the drawing and lettering show up as white lines against an opaque background. The coated side of the carbon paper is placed on the blueprint paper, in a printing frame, and exposed to light, and the blueprint is developed in the usual manner. Made in this way, the prints show blue lines on a white background, instead of white lines on a blue background.—A. Svenson, Okmulgee, Okla.

Paper Die Embossing Process Patented

On page 312 of our issue for February, there appeared a description of how to do embossing on paper. This article was purchased from one of our contributors in good standing. We find that the process is patented by Walter J. Ellis, and that the patent rights are being worked by the Ellis "New Method" Embossing Co., of 140 West 38th St., New York City. Any use of the process as described, without consent of the patentee, would therefore constitute an infringement of the patent.

High-Speed Potato Digging

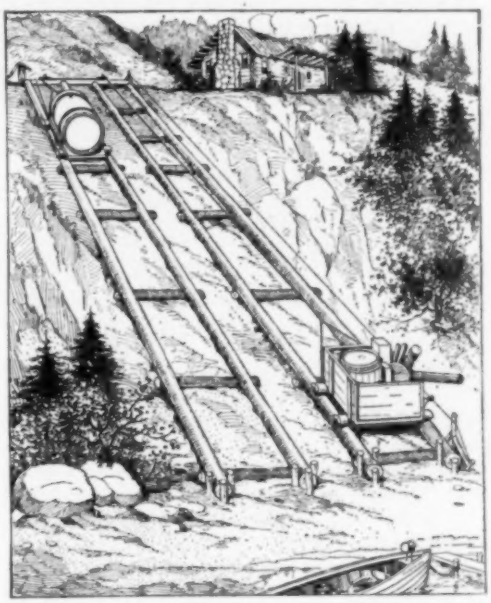
An amateur gardener has discovered an easy way to dig potatoes. In the spring, when the vegetables are planted, he places an old chain in each furrow, plants the potatoes over this, and covers them in the usual way. When the potatoes are ready to be harvested, one end of the chain is attached to the hub of an old cable drum, and the latter is rolled over the row. As the drum moves,

Labor-Saving Method of Harvesting Potatoes with a Buried Chain and a Cable Drum

it pulls the chain out of the ground, winding it on the hub. Practically all the potatoes are brought to the surface with the chain. It is then easy to collect them in baskets.—Frank W. Roth, Neosho, Mo.

Spring Water as Motive Power

The transportation of supplies up an embankment, about 175 ft. high, being a



Harnessing a Near-By Spring Saves Many Trips Back and Forth to Transport Supplies to the Top of a High Cliff

tiresome and tedious job, a simple inclined railway was rigged up to do the work. As shown, two skidways were made from long poles, alders being used in this instance. Two small cars were also made, one to carry the supplies, and the other a water tank. Eighty feet above the house was a spring, the water of which was piped to the cliff's edge. The empty car will slide to the bottom by gravity, as it is slightly heavier than the car containing the tank. After the car is loaded, the tank is filled with water, and when the clutch is released, the load is drawn to the top of the incline to be unloaded. —F. O. Sheldon, Seattle, Wash.

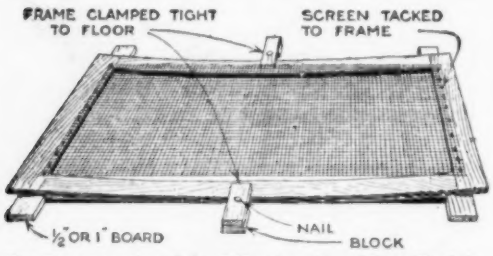
Novel Method of Watering Animals

To give a dog or horse a drink when the only available water is contained in a canteen or water bag, scoop a hole in the ground and line it with a piece of paper or water-resistant cloth, or even a big leaf, if available. Then pour in the water, and not a bit will be wasted.

Water in which meat has been cooked can be given to dogs in this way, while in camp, if both water and dishes are scarce.—Van Allen Lyman, Balboa, C. Z.

Stretching Fly Screens

It is always difficult to get wire screening uniformly and tightly stretched over a window or door-screen frame. Here is a way to overcome the difficulty. When the frame is made, lay it on a table or on the floor, with a ½-in. board under

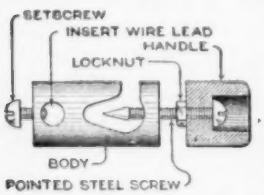


The Exasperating Job of Putting New Wire Cloth in Screen Frames is Much Simplified by This Method

each end. If the frame is a long one, a 1-in. board will not be too thick. Draw down both sidepieces by a nailed clamp, as shown, until they touch the floor. Tack on the screen cloth at each end, drawing it only moderately tight. When the clamps holding the frame down in the middle are removed, the frame will spring back to its original position, and the screen will be tight and ready to be tacked at the sides.—H. F. Grinstead, Columbia, Mo.

Electrical-Test Connector

A handy device for making electrical tests of, or temporary connections to, existing wiring, without the necessity of removing the insulation, is shown in the test connector illustrated.



The body may be of a round, square, or hexagon brass rod. The opening extends through the center of the rod, and is made in the shape illustrated, to accommodate wires of different dimensions, and also to allow the pointed steel screw to engage the wire after piercing the insulation. The hole is for attachment of the test lead, and the setscrew is to clamp it. The handle is made of round fiber rod, and the pointed steel screw is set tightly into the threaded hole and kept in position by the locknut.

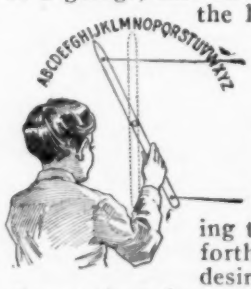
This connector can be applied with one hand; the steel screw can be easily removed and sharpened; a fairly heavy current can be carried, and if a heavier current is met with, the wire can be bared so that contact is established with the face of the slot.—Adapted from Electrical Review.

Tray Made from Picture Frame

An attractive tray for household use can be made from a picture frame, two sheets of glass, cut to fit in the frame, and a piece of figured cloth. The cloth is placed between the glass sheets, which are fastened in the frame with small nails. The right side of the cloth is turned toward the front of the frame. Door bumpers, attached to the back of the frame, at the corners, serve as legs for the tray.—S. Leonard Bastin, Bournemouth, England.

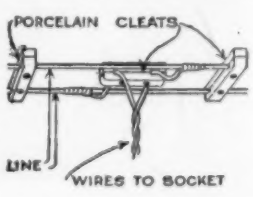
Child's Telegraphic Device

A 2-ft. stick of wood, pointed at one end and pivoted at its center to the wall of a garage, formed a dial for indicating the letters of the alphabet. This stick was connected at top and bottom, as shown, by fine spool wire, to a similar arrangement about 200 ft. distant. By pushing the pointer back and forth to the letters, as desired, the duplicate device at the other end of the line is made to register the same letters indicated on the garage wall.—Frank E. Brown, Pasadena, Calif.



Emergency Substitute for Rosette

In a temporary wiring job a shortage of rosettes was experienced, and the method illustrated was successfully used for suspending cross leading to a socket. An ordinary porcelain cleat was screwed to the ceiling between the mains in the position shown, and the flexible wires leading to the socket were gripped in. The joints were made by soldering the flexible wire to the line, and winding with tape. While the method would of course not be approved for



permanent wiring, it is a useful expedient to be familiar with in the case of temporary or emergency installation.—C. M. Adams, Milford, Ohio.

Stop on Dog Trolley

The only drawback to some dog trolleys is that, when the dog gets to the posts he winds himself around the post and gets tangled up. The result is that some one has to extricate him from the tangle. By fastening a large iron washer on the wire trolley, at the required distance from the posts, the animal is prevented from getting too close to the latter. Before attaching the washer to the trolley wire, slip on a 4 or 5-in. spring, to serve as a shock absorber for both dog and post.—Chas. W. Magnat, Jr., Paterson, N. J.

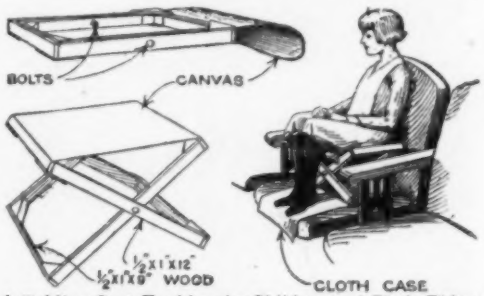
Tool for Making Garden Trenches

For making trenches in which seeds, such as cabbage, turnips, and collards, are to be planted, the tool shown will be found a desirable addition to the farm tools. The wheel is composed of two disks from an old disk harrow, placed together to form a convex wheel. The disks are held together by a bolt passed through the center holes. Both ends of the bolt are provided with long threads, and a nut is screwed on each side of the disks, jamming them together tightly. A pair of ordinary plow handles, drilled at the ends to receive the shaft, are attached by spreading the lower ends apart and fitting the shaft in the holes. A nut on each end of the shaft completes the tool.

When the seed bed has been prepared and the rows located, the trenching tool is rolled along the mark, and a neat trench, of about the proper depth for the seeds, is obtained. The trench is V-shaped and has a sharp bottom and steep sides; the seeds settle into the bottom in a narrow line that will vary hardly more than an inch, which greatly facilitates cultivating.—L. M. Jordan, Wallace, Ala.

Folding Theater Seat for Children

Parents would attend the movies more frequently with their children were it not for the inconvenience of supporting



A Folding Seat Enables the Children and Their Elders to Enjoy the Theater Performance

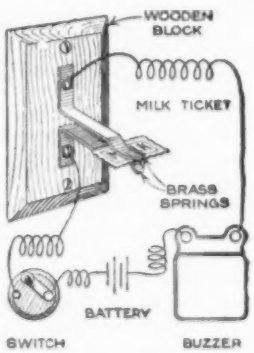
the child in a position to see the performance.

To overcome this difficulty, a simple folding stool was constructed that is placed on the regular theater chair and makes a comfortable seat for the child.

The seat is constructed of two wooden frames, suitably reinforced at the corners. One of the frames is made small enough to fit inside the other when the chair is folded. A strip of canvas, or carpet, is tacked over the top of the frames, as shown, to form the seat. A cloth case, or bag, is provided for ease in carrying, and this may be placed under the feet of the child when the seat is in use.

Milk-Ticket Signal Circuit

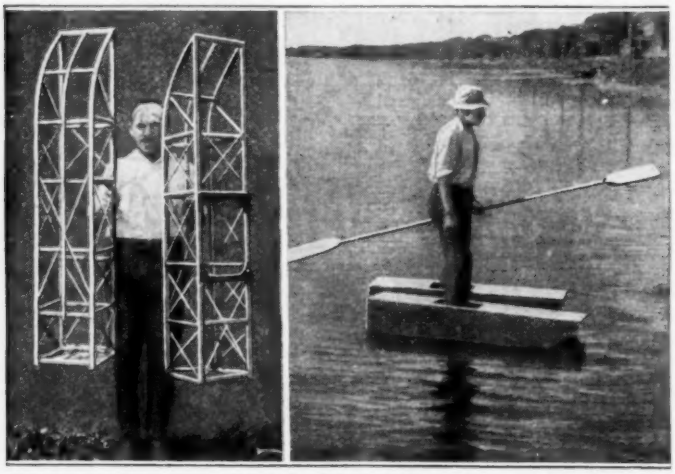
At times it is desirable that the housewife should have notice of the milkman's arrival, without having to neglect other household duties. A device for this purpose can be installed as follows: Two brass springs are made, mounted on a block, and connected to the circuit, as shown in the drawing. The milk ticket is placed between the brass springs, which come together, closing the circuit and ringing a buzzer, when the ticket is removed. A suitable switch is provided in the circuit, for turning off the buzzer after the ticket has been removed.—George Simonson, Springfield, Mass.



How to Make and Use Water Skis

By CARL S. BATES

ANYONE can easily make a pair of water skis, or shoes, that will enable him to promenade around on water as confidently as on land.



The Completed Framework of the Water Skis is Shown at the Left. To Prevent the Skis from Spreading, Cords are Attached at Stem and Stern. The Paddle Aids in Maneuvering

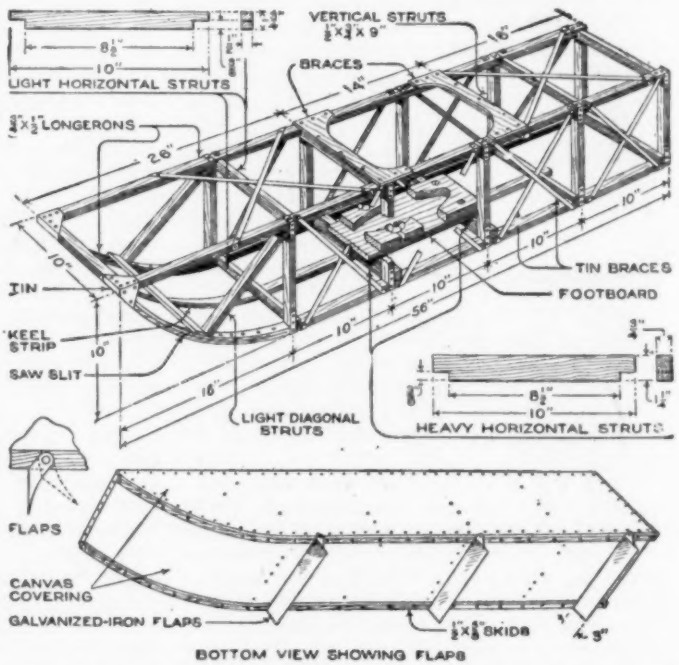
In assembling the framework of the skis, the sides should be built first. The work should begin at the rear, and the lower longerons should be bent last. Each side frame should be clamped to a bench in true position, while being trussed, as the tin strips give the frames their permanent boat-shaped form.

When the sides have been trussed up, the lower longerons are bent, after soaking in hot water, or steaming, for a few minutes. Bending is simplified by slitting the longerons as far as the first vertical struts. The light diagonal struts hold and strengthen the bends. After the side structures are completed, they are assembled into complete floats, by nailing on the horizontal struts, in the positions shown.

The V-blocks, at the rear of the heels, are permanently attached to the footboards. The blocks at the sides of the soles are provided with bolts and wing nuts, which make them adjustable for any position or width. The foot openings may be braced with corner blocks or thin strips, as shown.

The completed frames are painted with oil paint, before covering with canvas. The canvas should be tacked to the top, bottom, and rear, before the sides are covered. It must be tightly stretched across the frame and lapped over the edges, the tacks being driven into the lapped portions. When the sides are covered in the same manner, the canvas is waterproofed with two coats of a mixture composed of 80 per cent boiled linseed oil and 20 per cent japan drier, well worked into the fabric. A coat of oil paint may be applied for durability and appearance. The pine skids are attached after covering and painting.

To prevent back-slipping, heavy galvan-



Complete Working Drawings for Constructing a Pair of Water Skis: These Skis will Support a Weight of 150 Pounds with an Ample Margin of Safety

ized-iron flaps, having ears bent back and drilled for the attaching screws, are fixed to the skids. When the float is moving forward, these flaps will be parallel with the float, but will drop into a vertical position when at rest.

Strong cords, attached to screw eyes at bow and stern corners, prevent the floats from spreading more than 18 or 20 in apart. A two-bladed paddle, about 8 ft. long, is carried for safety and convenience in maneuvering. The skis described will support a 150-lb. person. By making the floats 12 in. square and about 5 ft. long, heavier weights may be borne.

Water skis, built according to these directions, are used similar to Alpine skis, but the user must pay more attention to balance, and accustom himself to the peculiar rising and sinking of the floats.

Material Required

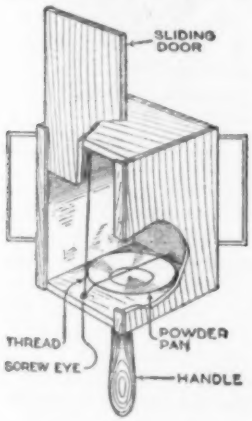
Footboards, 2 pieces, ½ by 7 by 13 in.
Keel strip, 2 pieces, ¾ by ½ by 54 in.
Upper longerons, 4 pieces, ½ by ¾ by 56 in.
Lower longerons, 4 pieces, ½ by ¾ by 62 in.
Horizontal struts, 4 pieces, ¾ by 1½ by 10 in.
Skids, 4 pieces, ½ by ⅝ by 62 in.
Braces, 4 pieces, ¼ by 1½ by 10 in.
Horizontal struts, 20 pieces, ½ by ¾ by 10 in.
Vertical struts, 20 pieces, ½ by ¾ by 9 in.
Miscellaneous: 5 yd. 8-oz. canvas or duck; four ¼-in. bolts with washers and wing nuts; four screw eyes; ½-in. flat-head brads; 1-in. flat-head brads; ½-in. tin strips.

To Restore Polish to Steel

To restore the brightness of polished steel, or iron, that has become badly tarnished but not badly rusted, apply ammonia soapsuds with a stiff brush, wash off with clean water, and dry by heat. Coat liberally with olive oil, and dust on powdered quicklime. Allow the oil and lime to stay on for about two days; then clean it off with a stiff brush and rub the steel with a soft cloth until it shines again.

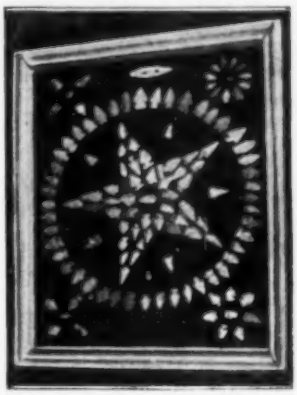
Trap Catches Flashlight Smoke

When a flashlight powder is exploded in the usual manner, a large volume of disagreeable smoke is liberated. The device illustrated was constructed by a photographer to confine the smoke when indoor flashlight pictures are taken. A wooden box, 6 in. long, 4 in. wide, and 4 in. deep, is equipped with a sliding door, and attached to a wooden handle. A small tin pan is fastened inside, to hold the powder. The door is held open by a thread, which passes through screw eyes, as indicated, and is stretched across the powder pan. The thread is burned in two when the powder explodes. This releases the door, which drops, closing the box. Before the door is opened, the contrivance is carried outdoors.



Ornamental Design of Arrow Heads

In many localities, Indian arrow heads are quite common, and enthusiastic collectors of these interesting bits of flint are usually to be found. Properly to display such specimens, which vary greatly in size and color, is rather difficult, as they all look pretty much alike to the "outsider." By arranging his collection into ornamental designs and inclosing these in frames, as shown in the photograph, one collector has made his collection of Indian flints of interest to all who see it, whether sharing the owner's hobby or not.—Felix J. Koch, Cincinnati, Ohio.

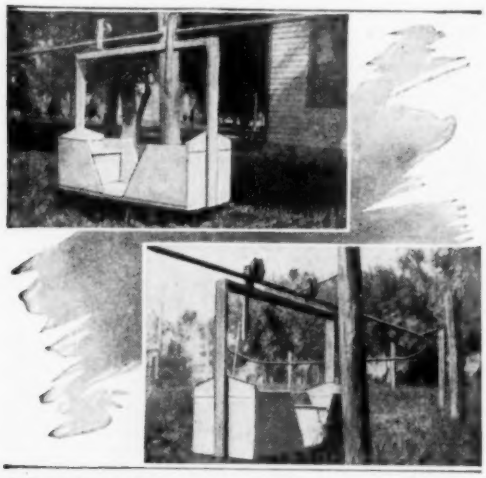


Clamp for Electric-Light Cord

A device for adjusting the height of an electric droplight can be made from a piece of fiber board, about 3 in. long, and 2 in. wide. In this is cut a diamond-shaped hole, approximately 2¼ in. long, and ½ in. wide. When the light cord is folded, and the loop formed in this way is passed through the hole, the cord is held at the ends of the hole. By enlarging the loop, the light is raised. The contrivance can be applied or removed in a few seconds.—E. A. Peterson, Victor, Colorado.

Children's Play Monorail System

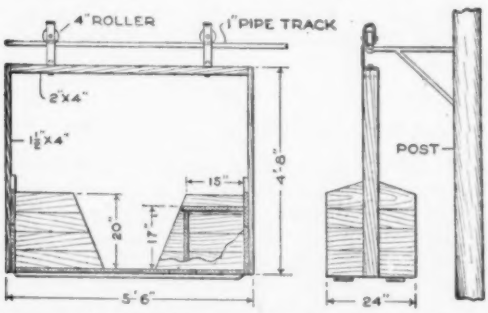
At comparatively small expense an overhead monorail system can be constructed in a back yard which will afford



A Back-Yard Monorail System Provides Diversion to Youngsters and Grown-Ups at Slight Expense

great enjoyment to children. The track is made of 1-in. pipe supported by iron brackets, extending 18-in. from cedar posts. The sections of the pipe are joined by inner metal or broomstick connections, and the track may be oblong or circular, sloping from a raised starting point. A platform beneath the raised portion enables the young passengers to enter and leave the car easily, while a rope is provided to pull the conveyance back to the starting point.

The car, the size of which may be made to suit the builder, is suspended from two ball-bearing grooved pulleys, 4 in. in di-



Suggested Dimensions and Details of Construction for the Back-Yard Monorail System

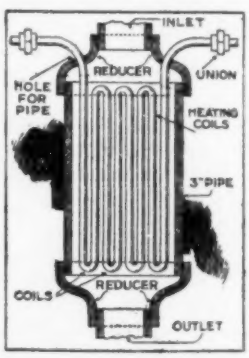
ameter. The posts should be located on the inner curve of the track instead of on the outside, as shown, as the centrifugal force would throw the car against the supports in making the curve. This track is 280 ft. long and, together with the car, cost $55 for the material.—F. Schulte, Remsen, Iowa.

Worn-Out Forceps Useful in Shops

In almost every physician's office, there are to be found small surgical forceps that have been laid aside as undependable because of slight wear. These instruments are great conveniences in shops, and they usually may be purchased for an insignificant sum, or obtained without cost. They can be employed in work that is too delicate for ordinary pliers or the fingers, such as picking up and setting small brads, screws, and rivets; placing bits of solder on seams; twisting fine wire, or assembling small pieces of machinery.—Dr. J. S. Moore, Portland, Ore.

Engine-Exhaust Water Heater

On motorboats and around shops using gas engines, the lack of hot water is readily overcome by utilizing the waste heat of the exhaust, without detracting from the efficiency of the engine. The drawing shows a water heater that is directly attached to the exhaust pipe. The heating coil is made of ¼-in. soft-copper tubing. When installed on motorboats, a small pump, driven from the flywheel or propeller shaft, pumps the water into an insulated tank, or supply line. The pressure should not be too high, or the water will be forced through the coil too fast to become heated. For shop use, without a pump, a barrel may be placed on a shelf, as a reservoir, and a pipe run from the bottom into the heater. A valve is provided underneath the barrel for regulating the flow of water. To obtain the full heating effect of the hot gases, the heater should be placed as close to the engine as possible. Increased efficiency is obtained if both heater and delivery line are covered with asbestos, or other insulating material. The jacket is made of standard pipe and fittings.—B. Francis Dashiell, Dunkirk, Md.



Tack Prevents Pencil from Rolling

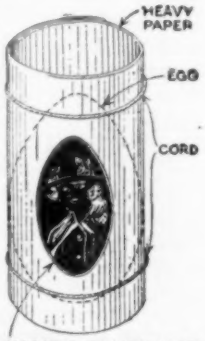
To prevent a pencil from rolling, stick an ordinary thumb tack into the wood near the unsharpened end. This will not interfere with the free use of the pencil, but will keep it in position on slanting desks or tables.—Hugh Scott, Toronto, Canada.

Hanging Fork on Side of Pickle Jar

In stores and restaurants where pickles are dispensed, the fork is very apt not to be found where it is needed. The illustration shows the idea of an ingenious grocer. An ordinary table fork is used for the purpose, one of the side tines being bent over to form a hook which is caught over the side of the container.

Easter Eggs Decorated with Photos

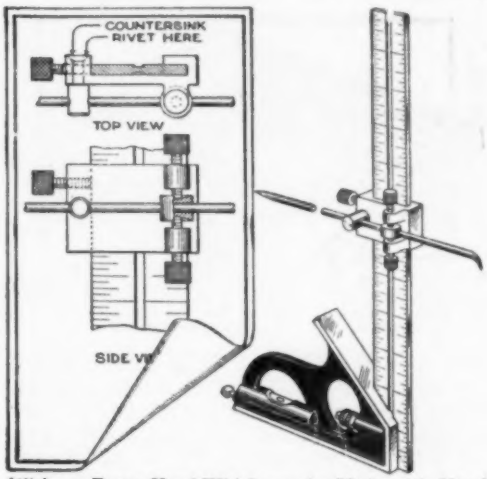
An interesting novelty in the decoration of Easter eggs is to print on the shell scenes or portraits from film negatives. Smooth, white eggs are selected and boiled. After removing them from the water and drying, the eggs are coated, while still warm, with blueprint-sensitizing solution, obtainable at photo-supply stores. The solution will dry almost immediately. The negatives are folded, or rolled, around the egg so that close contact is made with the sensitized spot. Then a piece of stiff paper, having an oval opening cut into it, is placed over the film-wrapped egg. The portion of the negative left uncovered by the oval opening in the paper is exposed to the light long enough to make a print. After removing the paper and film, the egg is washed in cold water, and the photograph comes out, printed in blue. Floral wreaths or borders may be painted around the finished print with ordinary water colors.—Cora Hamilton, Binghamton, N. Y.



NEGATIVE PLACED UNDER OVAL CUT IN PAPER

Surface Gauge Built onto Square

Amateur workers who have need for a surface gauge, but cannot spare the price of the usual instrument, may be interested in the possibility of building an extra head for a combination square, which will serve quite nicely the purposes of a surface gauge. A block of steel, or brass, is sawed out to the shape illustrated, and three screws with knurled heads are fitted into tapped holes. One of these is merely a setscrew to hold the gauge block at the proper position on the scale of the combination square. The other two provide the fine adjustment for the position of the scriber point. The scriber passes through two cylindrical metal pieces, being a tight sliding fit in both. The one at the right, in the side view, has cupped sides into which the points of the two knurled screws fit, and the one at the left is turned down to a smaller diameter at the end, so as to project through the gauge block. It is riveted on the other side to fit the countersunk hole, but this riveting must not be so tight that it is prevented from rotating slightly, as the adjustment is made with the two knurled screws.

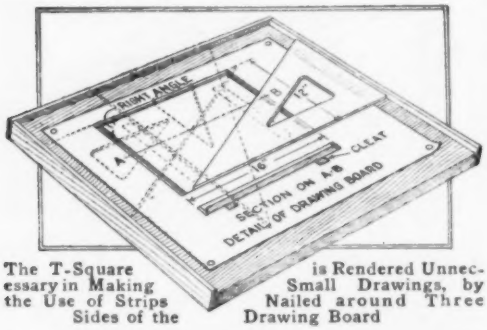


With an Extra Head Which can be Made with Hand Tools, the Combination Square is Converted into a Surface Gauge

¶A mixture of one part alcohol, three parts fusel oil (poison), and four parts of benzol, applied with a piece of cotton waste, will remove road tar from automobiles. Use sparingly, and wipe off in 5 or 10 minutes, to prevent injury to the paint. The mixture will not injure upholstery or metal parts.

Small Drawing Board for Use without T-Square

A convenient type of small drawing board, for use without a T-square, is

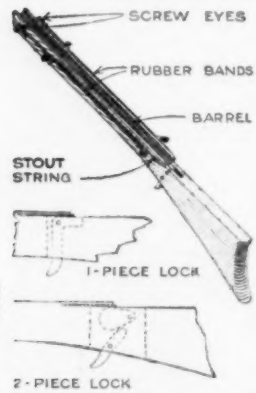


The T-Square is Rendered Unnecessary in Making Small Drawings, by the Use of Strips Nailed around Three Sides of the Drawing Board

shown in the picture. It is characterized by strips of wood nailed around it on three sides, projecting slightly above the surface of the board, so that triangles can be held against them. A board of this kind will save time on many small jobs. —C. B. Smith, Indianapolis, Ind.

Sling Shot Aimed like a Gun

Here is a cross between a crossbow and a sling shot; in other words, a sling shot that can be aimed like a gun. It is assumed that every boy knows how to make a crossbow. If not, either his dad or his chum will know. The gun is made much like a crossbow, rubber strips being used instead of a bow. Heavy rubber bands may be purchased at the druggist's, and cut so as to form one long strip. Then tie one of these to either side of the gun as in the illustration.



Each rubber band is tied to a screw eye at the front end, and the other ends are tied together by stout string. Now the rubber strips can be stretched until the string will go into the notch at the back end of the barrel, being thus stretched like a bowstring.

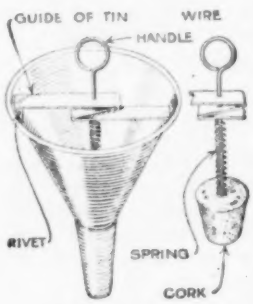
To the left is illustrated what would correspond to the lock of a gun, two methods of making this being shown. The parts are fastened loosely with nails in a slot cut from top to bottom through the rear end of the barrel, and they release the string from the notch. While the one-piece form of lock is easier to make, it pushes the cord against the notch, and wears the cord out much faster than the two-piece kind, which lifts it out.—Loyal R. Jones, Lansing, Michigan.

To Steady Camera in a Wind

To prevent a camera on a tripod from being moved by a strong wind, suspend a heavy weight, such as a stone or piece of metal, from the center of the tripod with a strong cord.

Combination Measure and Funnel

Equipped with a cork, to which is attached a wire handle, a funnel will serve as a measure, as well as in its original capacity. The handle passes through a tin guide, which is riveted, or soldered, inside the funnel. A coil spring holds the cork in place. Measured liquid is poured into the corked funnel, and marks are made on the latter to indicate different quantities. To empty the funnel, the handle is pulled upward.



Snaps Hold Light Clothes on Hanger

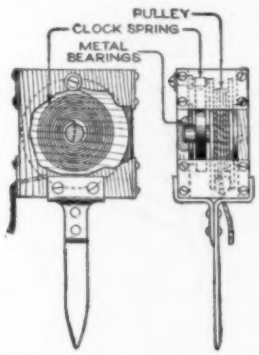
The ordinary coat hanger holds heavy garments quite satisfactorily, while light clothing has a disagreeable tendency to slide off. This shortcoming of the hanger is easily overcome without interfering with its usefulness for heavier clothing. Two spring-snap picture hooks are obtained, and the curved ends are straightened out, as shown. Two small holes are drilled, or punched, in this flat piece of metal. The hooks are attached to the hanger by small nails or screws.

Measures Made of Stovepipe

A handy measure for small quantities of feed, grain, or other materials, can be made from a section of stovepipe, by fastening a circular piece of wood into one end, for a bottom. A strap-iron handle may be riveted on, if desired. Liquid measures may be made in the same manner, but it will then be necessary to use a metal bottom and solder it in place. If a pipe 6 in. in diameter is used, the inside depth of the measure should be 9½ in. for a ½-peck or dry-gallon measure, or 8¼ in. for a liquid gallon. With 5-in. pipe, the depth should be 13¾ in. for ½ peck, or 11¾ in. for the wet gallon. When a wooden bottom is used in such measures, the pipe will need to be somewhat longer, in order to allow for the thickness of the bottom.

A Self-Winding Garden Line

In laying out rows in a kitchen garden, much time is saved if a self-winding line is used. Such a line is easily made by removing the spring from an old clock and attaching it to a shaft carrying a wooden pulley, or drum, for the line. The inner end of the spring is securely attached to the shaft, and the outside end is held by slipping the eye over a small stud. The shaft rests on metal bearings, which are fastened to the sides. Light metal plates are used for spacing and holding the sides. The handle should have a pointed end, which is thrust into the ground, enabling one person to do the work alone.—James P. Lewis, Golden, Colorado.

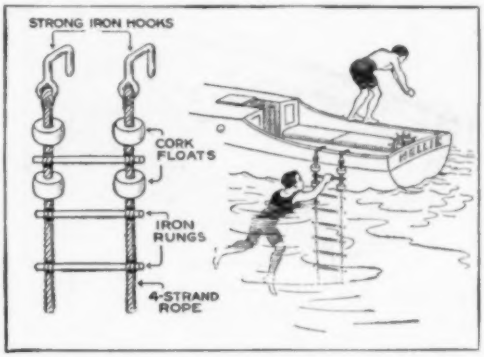


Razor Blade for Cleaning Glass

A tool which is useful in removing posters from windows and windshields is made by combining an old safety-razor blade with a piece of wood, shaped like the handle of a shaving brush, and of about the same size. The blade is set in a groove in the end of the handle. Both paper and paste can be scraped off glass with this easily made implement.

Motorboat Side Ladder

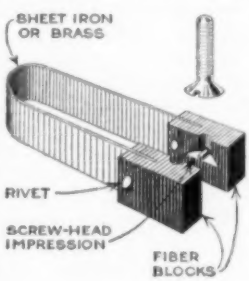
An 8-ft. ladder, having rope sides and iron rungs, such as the one shown, will be found a particularly valuable piece of motorboat equipment. The hooks should be large, strong, and long enough to prevent their working off. To prevent marring the gunwales, the hooks should be neatly wrapped with tape or canvas. The cork floats serve to prevent marring of the hull, to give finger room between the ladder and boat, and to keep the ladder from sinking, should it fall overboard. The sides are ¾-in. four-strand rope, and the rungs are inserted so that two strands will be on each side. To take the rope, shallow grooves are made in the rungs, about 1 in. from their ends.—Wm. F. Crowell, Providence, R. I.



A Short Length of Rope Ladder, Hung on the Gunwale, Adds Greatly to the Pleasure and Convenience of Motorboating

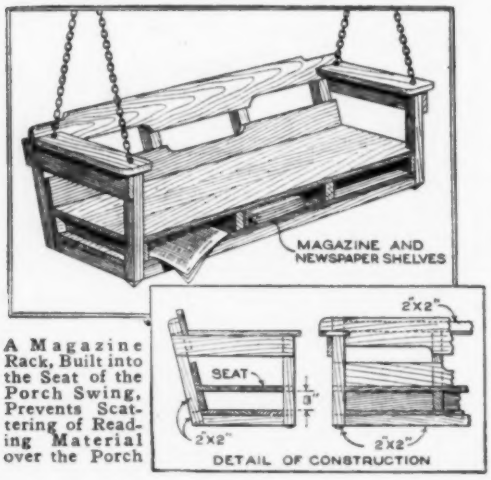
Jig Holds Small Screws in Vise

A simple jig for holding small machine or wood screws in a vise, for threading or filing, is made from two blocks of fiber, which are sawed to the size desired. The blocks are placed in the vise with the screw head between them, and pressure, sufficient to leave an impression of the screw head, is applied. The holding force of the apparatus will be increased if the screw slots leave small projections in the fiber, as shown. The blocks are slotted and riveted to a U-shaped piece of sheet iron for a handle —H. H. Parker, Oakland, Calif.



Magazine Rack in Porch Swing

When building a porch swing, a space under the seat for holding magazines and other reading matter, will be found quite a convenience, as the reading material is handy for the occupants, and is prevented from being scattered over the porch.



A Magazine Rack, Built into the Seat of the Porch Swing, Prevents Scattering of Reading Material over the Porch

The swing is made with a double bottom. The space between the two bottoms is divided into two or three compartments, according to the width of the swing, to prevent the seat proper from sagging. An old swing may be thus altered, by placing a new seat above the original one or, if the back is not high enough, underneath.—Edward R. Smith, Walla Walla, Wash.

Clothes Hanger as Necktie Rack

For the man who desires to keep his collection of neckties in orderly array, some sort of rack is necessary, and the illustration shows such a hanger, made at a minimum of expense and effort.

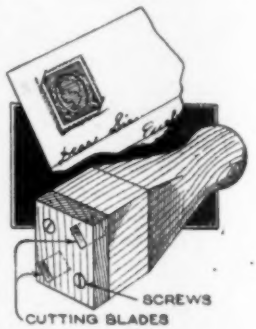
The wire hook of an ordinary wooden clothes hanger is straightened, withdrawn, and inserted from the opposite side, as shown. The hanger is completed by again forming the wire into a hook. The upward curve prevents the ties from slipping off.

Novel Footstool

A novel footstool can be made by an amateur carpenter from one end of a nail keg. The staves are sawed in half, with the exception of three, which are cut 1 in. longer than the others, to serve as legs. Hoops and cross braces are nailed inside, to make the stool stronger. A pad filled with excelsior, or hair, is fastened to the head, and heavy paper is tacked to the sides, to provide a smooth surface. Denim, or imitation leather, secured with large-headed upholstering tacks, is used to cover the stool.—G. L. Furse, St. Louis, Mo.

Tool Slits Paper for Attaching Stamps or Photo

When inclosing a postage stamp with a letter, many people follow the bad practice of moistening the gum on one corner of the stamp to hold it to the letter. This makes it impossible to attach the stamp properly to the envelope on which it is to be used. A much better method of sending stamps is to cut two slits in one corner of the sheet of letter paper, of such size that two corners of the stamp will fit into them.



This cannot be done very quickly by the use of the ordinary knife or scissors, as the slits have to be very accurately spaced. A convenient tool by which the slits can be cut instantly is shown in the drawing. It is made of blocks of wood, and an old safety-razor blade. Two pieces are cut, or broken, from the blade, each carrying a portion of the edge, $\frac{3}{8}$ in. long.

With a small drill and a scroll saw, two slits are made in a block of wood, $\frac{3}{8}$ in. long and $\frac{15}{16}$ in. apart. The pieces of razor blade are set into these slits, and the block is mounted with nails, or screws, on a larger block, which serves as a handle. In using the tool, the sheet to be cut is placed on a soft board, a piece of pasteboard, or several thicknesses of newspaper, and the tool is brought down onto it in just the position the stamp is to occupy. The slits

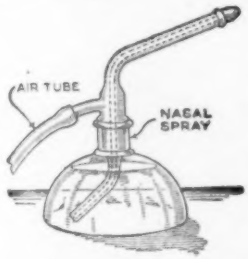
are thus cut, in which the stamp can readily be placed.

A stamp can be held somewhat more securely, if four such slits are made, one for each corner, and a little additional work will adapt the tool to cut all four slits at once. This is not necessary, however, as the two slits will hold the stamp with sufficient firmness.

A similar punch, somewhat larger, may be found quite useful in making slits to hold unmounted photographic prints in albums.

Nasal Spray Forms Blast Lamp

The usual type of nasal spray may be put to good use where a blast lamp is desired. Oil produces a very hot flame, and if air pressure is available, an old spray forms a convenient source of heat. With this type of spray, a good combustion mixture is obtained, as it operates partly by pressure and partly by suction. Pressure forces the oil up the tube, and the vacuum formed by air rushing past the nozzle of the inner tube draws the oil out through it.—Hobert M. Kraner, Columbus, Ohio.



Making Postcard Projector Views

Owners of postcard projectors frequently come across interesting views which are too small to fit the postcard-size carrier of the projector. This difficulty is remedied by cutting pieces of light cardboard to postcard size (3¼ by 5½ in.) and pasting the pictures in the center of them.

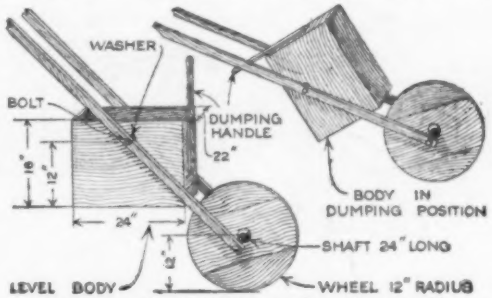
Original photographic prints may be mounted on cards with gummed art corners, without damaging the print, and in this way borrowed photographs may be shown without fear of injury.—Chas. A. Goddard, Los Angeles, Calif.

Flour as Substitute for Putty

If putty is not available when a bearing box is to be babbitted, a substitute may be made by mixing flour with sufficient water to make a dough stiff enough to be rolled and handled easily by the hands. The dough should be thoroughly mixed to avoid leaving lumps of flour.

Level-Body Wheelbarrow

A wheelbarrow, the body of which is always level, in whatever position the handles are elevated, is something of an improvement on the conventional type. Such a barrow is shown in the drawing, and may be made to any desired dimensions; those given being merely suggested as useful. The box is swung between the handles by means of two bolts, 2 in. long, which act as pivots. This wheelbarrow is quickly constructed, and will carry the load level, without spilling. A handle may be attached to the front end of the box, for dumping the load.—F. E. Brimmer, Syracuse, N. Y.

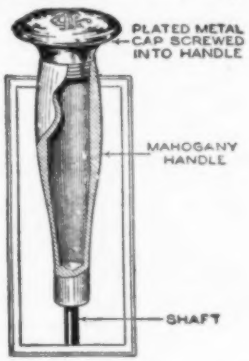


A Wheelbarrow Body Swung on Trunnions is Always Level, No Matter How the Handles are Elevated

Umbrella Cover Contained in Handle

An umbrella handle, which effectively solves the problem of mislaid covers, may be made artistic as well as convenient.

A piece of mahogany, or other suitable wood, is hollowed out as shown in the drawing, and an internal thread provided for the screw cap. A metal cap is turned and threaded externally. The wooden and metal parts may be finished and plated to meet individual requirements of taste. A neatly engraved monogram on the metal cap makes identification simple and adds to the attractiveness.—C. M. Breder, Jr., Washington, D. C.



¶A small nut, or other piece of metal, placed in a can of liquid metal polish, facilitates breaking up the sediment.

Self-Propelling Toy Locomotive Made from Scraps

By F. E. LEITCH

CHILDREN prize a toy of their own construction more than a similar and more finished article from the store. A few pieces of cardboard and wood, some spools, and the works of an old alarm clock combined as described, make the serviceable and workable toy locomotive, shown in Figs. 1 and 2 of the illustration.

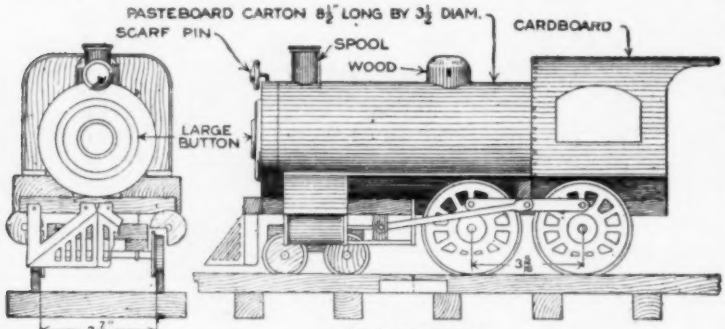


Fig. 2: FRONT VIEW

Fig. 1: ASSEMBLY

The engine frame, having a slot cut at the rear, for the belt, is first provided, as shown in Fig. 3. To this frame, the bumper, steam chests, boiler supports, drivewheel-bearing blocks, running boards, etc., are attached with nails or glue. The steam chests, each with an extension arm which forms the upper crosshead guide, are made from a single piece of wood. The spool cylinders are glued to the steam chest, and a similar extension should be attached to them, to form the lower crosshead guide.

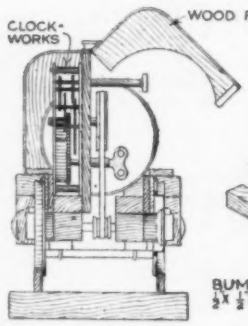


Fig. 4: POWER PLANT

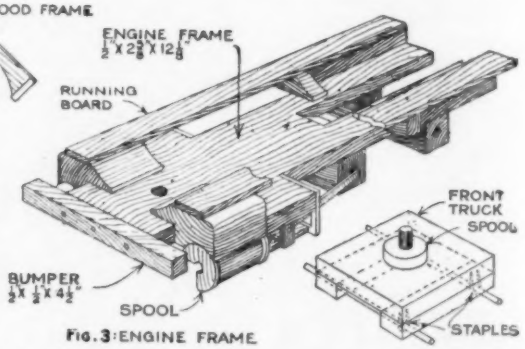


Fig. 3: ENGINE FRAME

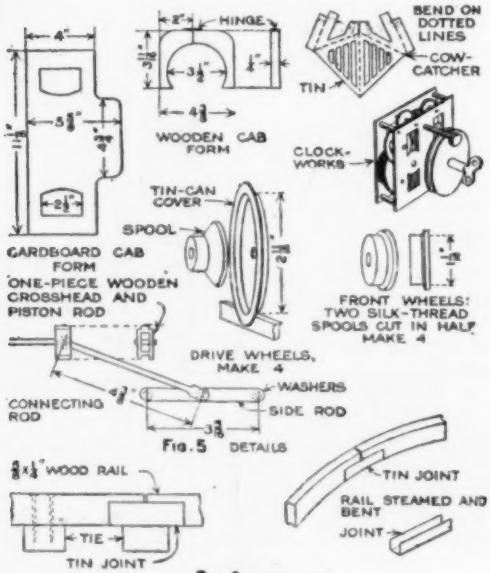


Fig. 5 DETAILS

Fig. 6 TRACKS

Spools, Can Covers, Some Odds and Ends of Wood and Cardboard, and the Works from an Old Alarm Clock are Cleverly Combined to Make the Workable and Serviceable Toy Locomotive Shown in Figs. 1 and 2. The Wooden Engine Frame, the Power Plant, and the Method of Power Transmission to the Rear Drivewheels, are Shown in Figs. 3 and 4. The Alarm Set of the Clockworks is Used as a Throttle to Start and Stop the Engine. Details of the Principal Parts of the Engine and Its Track are Shown in Figs. 5 and 6

The ends of the crosshead guides are held in position by a piece of tin, or wood, cut to the shape desired. The piston rods and crossheads, to which the connecting rods are attached, are cut from single pieces of wood, as indicated in Fig. 5. The drivewheels are made of four can covers, having half-spool hubs nailed to their centers, for attaching to straight, round wooden axles. The rear axle should have a small spool tightly attached in the center, as shown in Fig. 4, for the belt. The front truck, in Fig. 3, is attached to the engine frame by a small bolt passing through the center of the half-spool pivot. Small spools, cut in half, make the "pony" wheels for the front truck. The clockwork driving mechanism of the engine is installed in the cab, as shown in Fig. 4. All parts

having no connection with the alarm system are removed, and a wooden pulley is attached to the alarm-winding key, as shown. A heavy rubber band transmits the power from the clockworks to the spool on the rear axle. The boiler is made from a cardboard carton of the desired size. If such a carton is not available, a piece of heavy cardboard may be dampened and rolled into the shape required. The boiler is glued to the engine frame. After the boiler has been placed, the hinged wooden cab form, in Fig. 5, is put in place, and to this the cardboard cab is attached with glue and tacks. A cowcatcher is made from a piece of tin, cut to the shape shown in the detail, and tacked to the bumper. The smokestack is made from a spool, and the steam dome is cut from a piece of wood, both being glued to the boiler. To imitate the smoke door of a locomotive, a large button is attached to the front end of the boiler, as shown in Fig. 1, and a scarf pin, stuck into the top of the boiler, makes a convenient headlight.

A track for the engine is made of light wooden strips, nailed to wooden cross ties, as shown in Fig. 6. Curves in the line are made by steaming the rails to be bent, and tying them into the form desired until dry. The rail joints are made by bending small pieces of tin into the shape shown.

The alarm set of the clockworks serves as a throttle to start and stop the engine, which will run for about 20 ft. with one winding.

Staining Wood with Dyes

In the absence of specially prepared wood stains satisfactory substitutes are made by using package dyes, which are readily obtainable.

A package of dye, of the desired color, is dissolved in 1 pt. of warm water. The color is tested by applying a stroke or two, with a clean brush, to a piece of wood. If the color is too light, more dye should be added or the solution "boiled down." If the color is too strong, more water is added. After the first coat has been applied, if the desired shade is obtained, the work is allowed to dry thoroughly, and a light coat of shellac is applied. If a darker shade is wanted, another coat of stain may be added after the first application has dried. The shellac coating gives a glossy and waterproof finish, and prevents soiling of the surface.

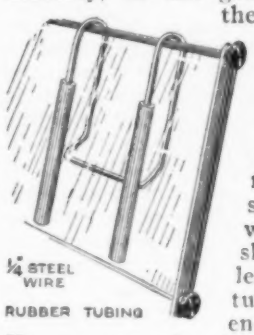
Star-Forming Toothpick Trick

As a part of an evening's entertainment of tricks and games, a simple performance which merely requires five toothpicks will mystify the onlookers.

The toothpicks are bent, as evenly as possible, in the center, and arranged as shown in the drawing. Then place a drop of water in the center of the figure, and in a few minutes the toothpicks will expand sufficiently to form a larger star.—D. Geo. Logan, Jr., Pittsburgh, Pa.

Quickly Made Windshield Cleaner

Various preparations applied to the windshield surface are more or less satisfactory, as the greasy coating allows the rain to run off rapidly, but wiping is perhaps the most effective method against snow.



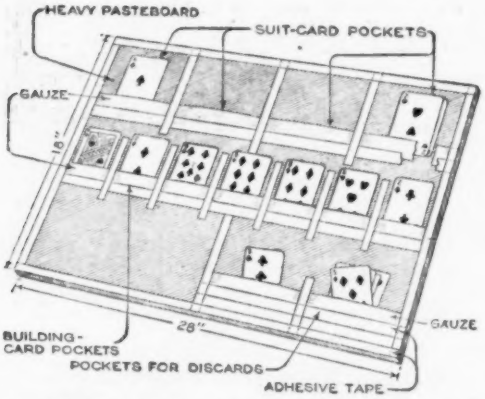
A simple cleaner, or scraper, is easily made from ¼-in. steel or brass wire, which is formed as shown. Two short lengths of rubber tubing over the free ends form the wiper. To prevent the tubing from working loose, the ends of the wire are first coated with rubber cement before the tubing is slipped on. Care should be taken to have the middle of the wire loop, which bears on the inside of the glass, at a point about opposite the middle of the rubber tubes, for in this way an even pressure is applied by the rubber tubes over their whole length.—Ronald L. Prindle, N. Abington, Mass.

Tire Chain Holds Boat

An old tire chain can be made into a rowboat painter by removing the cross links, and fastening the sidepieces together with wire, leaving the clasps on the ends. One end of the chain is attached to the boat. The free end is passed around a tree or post, and the boat is fastened by hooking the clasp into a convenient link.

Solitaire Board Aids Invalid

It is not particularly difficult to play card games when sitting at a table, but let the solitaire enthusiast be forced to



Invalids Who are Compelled to Remain in Bed are Enabled to Play Solitaire Quite Comfortably with This Easily Made Game Board

remain in a reclining position and "canfield" becomes impossible. The card table in the drawing is made from a piece of heavy pasteboard, or corrugated board, and is covered with cloth, which is securely held with strips of adhesive tape around the edge. Pockets to hold the various cards are formed of strips of gauze and adhesive plaster, or tape. With such a table resting lightly across one or both knees, the game may be played almost as comfortably as at a table.—Truman R. Hart, Ashtabula, Ohio.

Clothes Drier for Small Articles

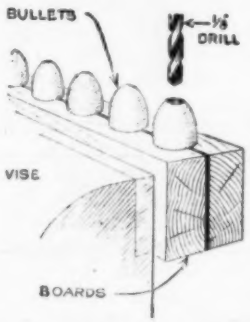
An arrangement for drying baby's clothing, or various other small items of the family laundry, is made from an old window frame. Screw eyes are screwed into the sides, and wire lines strung across the frame, as shown. Two screw hooks in the top permit it to be suspended from the clothesline. The use of this device does away with cold fingers in the winter, and on stormy days the frame may be hung near the stove.—Mrs. Grace E. Willey, Concord, N. H.

Photographing High-Speed Airplanes

In photographing swiftly moving objects, such as airplanes in flight, or running automobiles and trains, it is almost impossible to employ the view finder on an ordinary camera for locating the subject. By placing the camera so that the image of some stationary object can be seen in the finder, and then sighting over the top of the machine at the object, a method can be discovered for pointing the lens in the proper direction without consulting the view finder. The thumb of the operator may be used as a rear sight, and some projection near the front of the camera, like the finder or the leg, will serve as a front sight; or pins may be stuck in the machine as sights. When the proper positions for them have been determined, the camera can be aimed in the same manner as a gun in the hands of a trapshooter.—R. J. Hoffman, New York, N. Y.

Making Hollow Bullets

Hollow-point bullets are much more effective at short range than solid ones, and are easily made. Two ½-in. boards, each as wide as the cartridge case is long, are placed together in a vise and drilled on the line where they join. Insert the cartridges in the holes thus provided, and clamp them firmly in the vise, bullet end up. Mark the center of each bullet with a punch, and drill with a ⅛-in. bit, to a depth of from 3/16 to ¼ in. In making the wooden cartridge clamp, use 5/16-in. holes for .32-caliber, ⅜ in. for .38-caliber, and 7/16 in. for .44 and .45-caliber cartridges. Rifle bullets should not be hollowed out.—J. F. Ford, Portland, Ore.



Staples Mend Cracks in Shoe Soles

Quite often shoe soles break in the instep, and to repair them neatly is difficult. The cracked leather can be joined satisfactorily with carpet staples, the points of which are driven on either side of the break, and clinched inside the shoe.—John Edison Englert, Mill Hall, Pa.

PICTURED LETTER BRINGS NEWS OF LOST COMRADES

A gratifying letter reached the office of Popular Mechanics Magazine some time ago from the ex-soldier whose travel-worn letter was pictured in the issue for November, 1919. He writes that he was taken from his old company and sent to a hospital when in France; later he was returned to this country and discharged. Unfortunately, during these months of travel as a casual, he lost all touch with comrades in his old organization. Even when settled once more in his home in Indianapolis he could find none of them, as the company had been recruited from all corners of the United States. Then the picture of the battered envelope, showing his name and address, appeared in this magazine. It caught the eyes of his old friends. To date he has received letters from more than 50 of them.

EXPLAINS METRIC-SYSTEM UNITS IN ONE-MINUTE LECTURE

The extreme simplicity of the metric system of measurements, and the ease with which its units may be mentally adjusted to those now in use, were strikingly demonstrated recently by a member of a western business club, who gave all the explanation needed in a one-minute lecture. His brief but complete synopsis of the system was this:

"Learn only the units—dollar, meter, liter, gram; dollar, the measure of value; meter, the measure of length; liter, measure of bulk; gram, for weight. You know all about the American dollar. The metric units, meter, liter, gram, are just like dollar, divided decimally and multiplied decimally. If you want to compare metric units with present units, the meter is 10 per cent more than the yard; 500 grams is about 10 per cent more than the pound avoirdupois; the liter is 5 per cent less than the U. S. liquid quart (13 per cent less than the British liquid quart). That is all 90 per cent need to use the metric standards."

TWO NEW UNITED STATES MAPS USE DIFFERENT PROJECTION SYSTEMS

A method of projection which gives correct areas at all points is the feature of the smaller of two new outline base maps of the United States, just prepared by the U. S. Coast and Geodetic Survey. The map is laid out on the zenithal system, working from its geographical center, which is an imaginary point near Lebanon, Kan. The northern part of Mexico is included. As it is intended mainly for statistical work, to which this projection is especially suited, only the state boundaries, large rivers, and important cities are shown. Its scale is 1 to 7,500,000, making a sheet 25¾ by 19¾ in., with a maximum scale error of only 1¾ per cent. The other map has a scale of 1 to 5,000,000, measuring 39 by 25 in., and employs the conformal conic projection, which accurately represents the shape of any unit of surface, but at the extreme southern points gives a maximum scale error of 2½ per cent, and a maximum areal error of 5⅓ per cent.

REVEALS METHOD OF MANUFACTURE OF ENAMELED CAST-IRON WARE

Enameled cast-iron ware is made by painting the clean casting with a water paste of powdered glass, clay, and other ingredients, fusing the coating in the furnace, and then applying finishing coats of powdered white glass. Various formulas for the enamel, and methods of preparing and conducting the entire process, are described in Technologic Paper No. 142 of the U. S. Bureau of Standards, recently issued. Copies of the paper, which is in the form of a 158-page book, are available to anyone interested, on application to the bureau.

¶ Unable to back out of a new baking oven, beneath which burned a bright fire, a large-dimensioned baker of Tacoma, Wash., recently suffered acute mental agony while rescuers pulled vainly at his projecting feet. Emerging at last through a breach in the brick wall he explained that he had wriggled through the door to see how the interior looked. The heat seems to have had an expansive effect, as he found himself unable to wriggle back.

YOUNG REPUBLICANS HAVE CHANCE TO WIN BIG CASH PRIZES

A first prize of $6,000, and second and third prizes of $3,000 and $1,000, respectively, are offered through the Republican National Committee to American men or women, not more than 25 years old, who write the best campaign platform for that party. The purpose of the offer is to encourage political thought among young voters, and to bring to platform preparation a more deliberate and serious consideration than it is usually accorded. The donor is Truxton Beale, former U. S. minister to Persia, whose son, lost in the service, is memorialized by naming the competition the Walker Blaine Beale contest. Manuscripts are to be addressed in that name to the committee headquarters at 923 Woodward Ave., Washington, D. C. Writers are limited to 6,000 words, four typewritten copies to be submitted but only one signed. March 31 is the time limit for receipt of manuscripts.

IDEAS FOR NAVAL IMPROVEMENT MAY DRAW CASH REWARD

Civilians in all walks of life, as well as naval employes, are included in the provisions of an act of congress approved some time ago, authorizing cash rewards for accepted ideas. Articles to be accepted must possess novelty as well as value. It is necessary that applicants for such reward comply carefully with specific directions prepared by the Navy Department, and refrain from sending suggestions which do not fall within the class described, or which are of a frivolous nature. Models of inventions are not desired, and the department furnishes sheets for sketches, and blanks to be filled out by the aspirant, all to be addressed to the "Secretary of the Navy, Inventions."

ESSAYS ON ECONOMIC SUBJECTS ARE AWARDED PRIZES

A treatise on the subject of "The Position of the Laborer in a System of Nationalism" won its author, an eastern university professor, a cash prize of $1,000 the other day. The occasion was a contest conducted by a large clothing manufacturer in the middle West, for essays on economic conditions. A second prize of $500 was won by a southwestern university writer, who selected the topic "The Guarantee of Bank Deposits," while an eastern undergraduate did so well with the subject of "The American Street-Railway Problem" that he was awarded the $300 third prize.

INCOME-TAX PAYERS TO REPORT ITEMS OF OUTGO ALSO

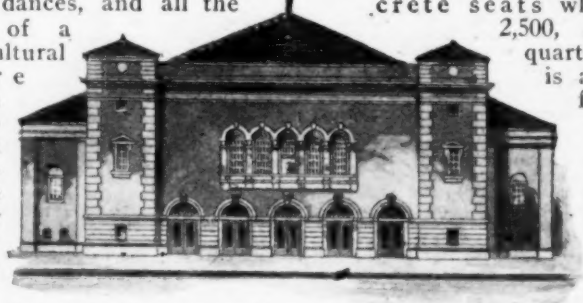
So much information has been published about the listing of taxable incomes that the equally important matter of reporting items of outgo has been somewhat obscured. The U. S. Bureau of Internal Revenue requires a record of each total payment of $1,000 or more, made during the year to any other person or organization, in the shape of rent, interest, wages, bonuses, commissions, or fees. Such reports, called "information returns," are made on separate forms furnished by the bureau. They are necessary to the work of checking up the income-tax returns.

INQUISITIVE MOUSE CAUGHT BY LIVE OYSTER

Inquisitive or hungry, a mouse poked its head between the open shells of a live oyster in an England fish market one night not long ago, and paid for the foolhardy experiment with its life, as the mollusk clamped down the sharp edges of its shells on the rodent's skull and throat, killing the animal. The mouse was found in the unusual trap by the proprietor of the store on the following morning.

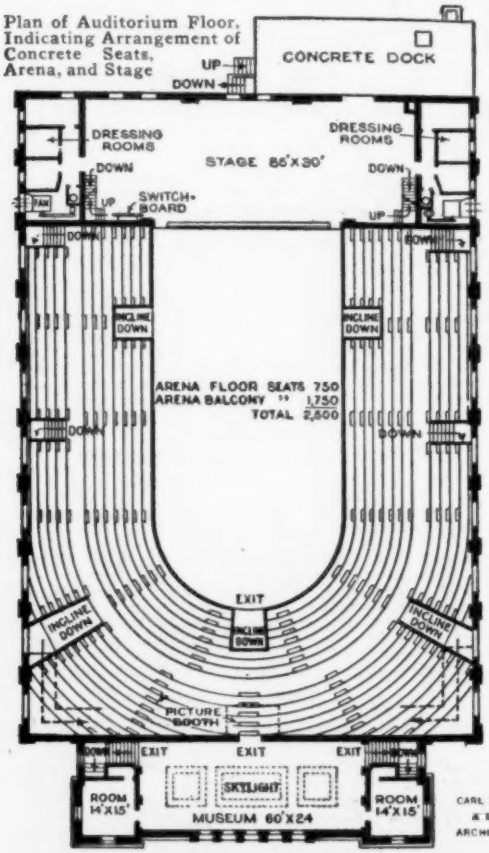
ARRANGE NEW MEMORIAL HALL FOR MANY USES

EXHIBITIONS and sales of live stock, poultry, and farm crops, athletic events, dances, and all the entertainments of a lively agricultural community, are provided for in the Liberty Memorial Hall just built at Wellington, Kan. The building, for which $140,000 in city bonds was subscribed, is of stone, brick, and concrete on steel, and harmonizes with the city hall and public library in the same block. Its floor measures 196 by 118 ft., with an arena 100 by 50 ft., concrete-floored with a maple false floor for dancing. Under the concrete seats which accommodate 2,500, are live-stock quarters. At one end is a stage, 85 by 30 ft., with dressing rooms, and over the lobby a museum room, 60 by 24 ft., holding the bronze tablets of the town's war record. In this room, also, will be kept those local relics, trophies, and other educational objects, in which every well regulated community takes justifiable pride.

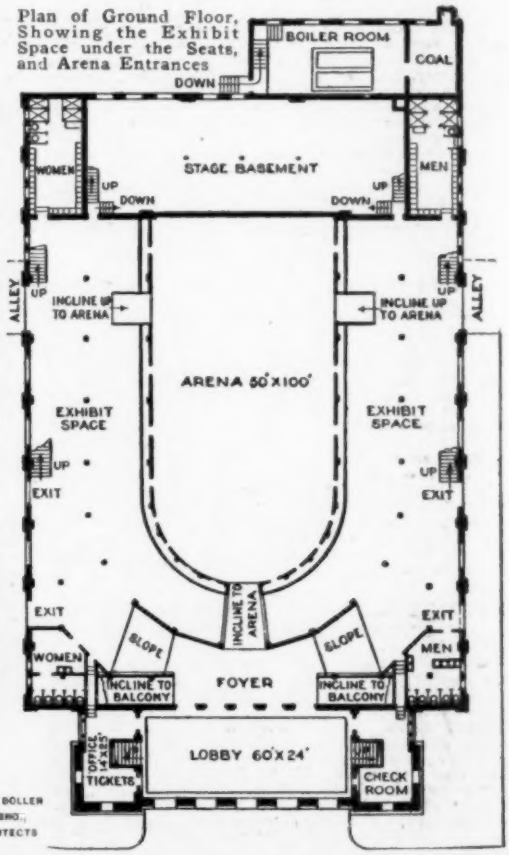


Front Elevation of the New Memorial Hall at Wellington, Kansas, Showing the Main Entrance, Office Towers, and Museum-Room Windows

Plan of Auditorium Floor, Indicating Arrangement of Concrete Seats, Arena, and Stage



Plan of Ground Floor, Showing the Exhibit Space under the Seats, and Arena Entrances



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